RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR)
SUPERFUND SITE
OPERABLE UNIT 2

BOUNTIFUL, UTAH

August 2004

U.S. Environmental Protection Agency
999 18th Street, Suite 300
Denver, Colorado 80202

RECORD OF DECISION

INTERMOUNTAIN WASTE OIL REFINERY (IWOR) SUPERFUND SITE
OPERABLE UNIT 2
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The U.S. Environmental Protection Agency (EPA), with the concurrence of the Utah Department of Environmental Quality (UDEQ), presents this Record of Decision (ROD) for the Intermountain Waste Oil Refinery (IWOR) Superfund Site Operable Unit 2 (OU2) in Bountiful, Utah. The ROD is based on the Administrative Record for IWOR OU2 including the Remedial Investigation/Feasibility Study (RI/FS), the Proposed Plan, the public comments received, and EPA's responses. The ROD presents a brief summary of the RI/FS, actual and potential risks to human health and the environment, and the Selected Remedy. EPA followed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Contingency Plan (NCP), and EPA guidance in preparation of the ROD. The three purposes of the ROD are to:

1. Certify that the remedy selection process was carried out in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. 9601 *et seq.*, as amended, and, to the extent practicable, the NCP;

2. Outline remediation requirements of the Selected Remedy; and

3. Provide the public with a consolidated source of information about the history, characteristics, and risk posed by the conditions at IWOR OU2, as well as a summary of the cleanup alternatives considered, their evaluation, the rationale behind the Selected Remedy, and the Agency's consideration of, and responses to, the comments received.

The ROD is organized into three distinct parts:

1. The **Declaration** section functions as an abstract and data certification sheet for the key information contained in the ROD and is the section of the ROD signed by EPA's Assistant Regional Administrator for Ecosystems Protection and Remediation and the Executive Director of the Utah Department of Environmental Quality.

2. The **Decision Summary** section provides an overview of the IWOR site investigation, the cleanup alternatives evaluated, and the analysis of those options. The Decision Summary also identifies the Selected Remedy and explains how the remedy fulfills statutory and regulatory requirements; and

3. The **Responsiveness Summary** section addresses public comments received on the Proposed Plan, the RI/FS, and other information in the Administrative Record.

Part 1

The Declaration
Record of Decision
Intermountain Waste Oil Refinery
Operable Unit 2

Declaration for the Record of Decision Intermountain Waste Oil Refinery Operable Unit 2

Site Name and Location

Intermountain Waste Oil Refinery (IWOR) Superfund Site
Operable Unit 2 (OU2)
Bountiful, Utah
CERCLIS # UT0001277359

Statement of Basis and Purpose

This decision document presents the selected remedy for the IWOR OU2. This Record of Decision (ROD) has been developed in accordance with the requirements of the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA) of 1980, 42 U.S. Code (USC) §9601 *et seq.* as amended, and to the extent practicable, the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 CFR Part 300.

This decision is based on the Administrative Record for IWOR OU2. Copies of key documents are available for review at the Davis County Library South Branch located at 725 S. Main in Bountiful, Utah. The entire Administrative Record may also be reviewed at the EPA Superfund Record Center, located at 999 18th Street, 5th Floor, North Terrace; Denver, Colorado.

The Utah Department of Environmental Quality (UDEQ) concurs with the selected remedy.

Assessment of Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Trichloroethylene (TCE) is in the groundwater above drinking water standards and the risk based levels of concern.

Description of the Selected Remedy

The Selected Remedy for addressing the IWOR OU2 is groundwater extraction and treatment and dual phase extraction (DPE), which is a combination of Alternatives GW-2 and GW-5 as identified in the Proposed Plan. In addition to addressing the contaminated ground water, the remedy includes the removal of about 25 one - and five-gallon containers in the garage that if not managed properly, could cause concern in the future. The containers contain lead based paint, solvents and other chemicals.

The OU2 selected remedy treats the waste in the ground water and prevents further spreading of the groundwater contamination. The OU2 Feasibility Study (FS) used a comparative analysis to evaluate five alternatives. The components of the selected remedy include:

- Dual Phase extraction and treatment. Where effective in removing contaminated vapors as well as contaminated ground water, DPE will be used. DPE involves pumping ground water and soil vapors from the same well. Where, or when, there are no significant contaminated soil vapors recovered through DPE, groundwater pump and treatment will be used.

- Land Use Control, or institutional control. The land use control will prevent the installation of a drinking water well on the property until drinking water standards are met in the ground water.

- Monitoring. A monitoring plan to evaluate the effectiveness of the remedy will be developed and implemented. The plan will likely include sampling at least four wells monthly for the first six months, and quarterly thereafter.

- Treatment and Discharge. The ground water that is extracted will be treated by a treatment system that uses granular activated carbon to remove the contaminants. The treated water will be discharged to a storm water drain or other approved discharge point.

- Disposal of containers. There are about 25 one and five gallon containers currently stored in the garage. A number of the containers contain lead-based paint and most would be classified as a hazardous waste for disposal purposes. Proper disposal now will prevent any potential future risks from mismanagement of these containers.

OU2 covers contaminants found in the ground water, mainly trichloroethylene (TCE), that are above drinking water standards and the risk based levels of concern. A first Operable Unit (OU1) addressed contaminants found in soils, subsurface soils, and tanks or containers. The ROD for OU1 was signed in November 2002.

Statutory Requirements

The selected remedy for OU2 is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate for the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy.

Because this remedy should not result in hazardous substances or pollutants or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure to ground water, a statutory review will not be required. It is expected that the remedial action objectives (cleanup levels) will be reached within five years. If the remedy takes more than five years to attain remedial action objectives, a policy review may be conducted within five years of construction completion to ensure that the selected remedy is, or will be, protective of human health and the environment.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record for this Site.

- Contaminants of concern and their respective concentrations. (ROD Section 5)
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD. (ROD Section 6 & 7)
- Baseline risk represented by the contaminants of concern. (ROD Section 7)
- Cleanup levels established for chemicals of concern and the basis for these levels. (ROD Section 8)
- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy. (ROD Section 12)
- Estimated capital costs, annual operation and maintenance costs, total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected. (ROD Section 12 & Table 12-1)
- Key factors that led to selecting the remedy. (ROD Section 12)

Max H. Dodson
Assistant Regional Administrator
Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

Date 8/5/04

The following authorized official at the State of Utah approves the selected remedy as described in this Record of Decision.

Dianne R. Nielson
Executive Director
Utah Department of Environmental Quality

8/10/04
Date

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Acronyms

amsl	above mean sea level
AST	above-ground storage tank
bgs	below ground surface
BHHRA	baseline human health risk assessment
CDM	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
COC	contaminants of concern
COPC	contaminant of potential concern
DCA	dichloroethane
DCE	dichloroethene
DDT	dichlorodiphenyl-trichloroethane
DSHW	Division of Solid and Hazardous Waste
DO	dissolved oxygen
DPE	dual phase extraction
DPT	direct push technology
ECHOS	Environmental Cost Handling Options and Solutions
EPA	U.S. Environmental Protection Agency
ESI	expanded site investigation
FS	feasibility study
ft	feet
ft/day	feet per day
GAC	granular activated carbon
gpm	gallons per minute
GRO	gasoline range organics
HHRA	human health risk assessment
HQ	Hazard Quotient
IC	institutional control
in	inch
IWOR	Intermountain Waste Oil Refinery
kg/L	kilogram per liter
L/kg	liter per kilogram
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NAPL	non-aqueous phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (or National Contingency Plan)
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
OV	organic vapor
PCA	tetrachloroethane
PID	photoionization detector

POTW	publicly owned treatment works
ppm	parts per million
PRP	potentially responsible party
PVC	polyvinyl chloride
RAOs	remedial action objectives
RBC	risk based concentration
RI	remedial investigation
ROD	record of decision
SCDM	Superfund Chemical Data Matrix
scfm	standard cubic feet per minute
SI	site investigation
site	Intermountain Waste Oil Refinery OU2 Superfund site
SRC	Syracuse Research Corporation
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
TAL	target analyte list
TCE	trichloroethylene (or trichloroethene)
TIC	tentatively identified compound
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TS	treatability study
UDEQ	Utah Department of Environmental Quality
UST	underground storage tank
VGAC	vapor phase granular activated carbon
VOC	volatile organic compound
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

Glossary

Administrative Record: The body of documents EPA used to form the basis for selection of a remedy.

Air Sparging: A technology which forces air into the aquifer where it volatilizes contaminants in ground water.

Alternative: An option for reducing site risk by cleaning up or otherwise limiting exposure to contamination.

Applicable or Relevant and Appropriate Requirements (ARAR): Federal and State requirements for cleanup, control, and environmental protection that a selected remedy for a site will meet.

Baseline Human Health Risk Assessment (BHHRA): A study conducted as part of the RI that determines and evaluates risk that site contamination poses to human health.

Capital Costs: Expenses related to the labor, and equipment and material costs of construction.

Cis-1,2-Dichloroethene: A form of 1,2-dichloroethene. It is a colorless liquid often used as a solvent. **Dichloroethene** (DCE) is a degradation product of TCE.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA): A Federal law passed in 1980 and modified in 1986 and 2001. It sets up a program to identify sites where hazardous substances have been, or might be, released into the environment and to ensure they are cleaned up. Most of these sites are abandoned or are no longer active.

1,1-Dichloroethane: A breakdown product of 1,1,1-trichloroethane. A colorless volatile organic compound often used as a solvent for the removal of grease from metal.

Dual Phase Extraction (DPE): A technology in which extraction wells are placed in the contaminated zone and both ground water and air are extracted.

Feasibility Study (FS): The FS identifies and evaluates the most appropriate technical approaches to address contamination problems at a Superfund site.

Land Use Control: Frequently called institutional controls (ICs). A non-engineered or non-constructed mechanism that minimizes the potential human exposure to contamination. An example would be a deed restriction that places requirements on future development.

National Contingency Plan (NCP): The EPA's regulations governing all cleanups under the Superfund program.

National Priorities List (NPL): EPA's list of the potentially most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response.

Operable Unit (OU): A division of a site to more efficiently address investigation and cleanup. Sites are often divided into operable units by media (soil and ground water), or, for large sites, by location of contamination.

Operation and Maintenance Cost (O&M): The cost of operation, maintenance, materials, energy, waste disposal, and administrative activities of the remedy.

Present Worth Cost: An analysis of the current value of all costs. Also known as Net Present Worth, the Present Worth Cost is calculated based on a 5-year time period and a predetermined interest rate (7% for this ROD).

Proposed Plan: A document requesting public input on a proposed remedial alternative.

Record of Decision (ROD): A document that is a consolidated source of information about the site, the remedy selection process, and the selected remedy for a cleanup under CERCLA.

Remedial Investigation (RI): A study conducted to identify the types, amounts, and locations of contamination at a facility. It also evaluates possible risk to public health and the environment from exposure to contamination.

Removal Action: The cleanup or removal of released hazardous substances from the environment.

Soil Vapor Extraction (SVE): A technology in which air extraction wells are placed in contaminated zones and air is then vacuumed from the soil.

Superfund site: The commonly used term for a site addressed under CERCLA.

Treatability Study: A study of the implementability and effectiveness of the remedial action alternatives.

Trichloroethylene: Also called trichloroethene. A colorless volatile organic compound often used as a solvent for the removal of grease from metal.

Part 2

Decision Summary
Record of Decision
Intermountain Waste Oil Refinery
Operable Unit 2

Section 1: Site Name, Location, and Brief Description

The Intermountain Waste Oil Refinery (IWOR) property (Site), EPA ID UT0001277359, is located in Section 30, Township 2 North, Range 1 East in Davis County. The Site is a former waste oil facility in Bountiful, Utah at 995 South 500 West (Figure 1-1). The surrounding land use is residential/commercial; however, most of the land use within a 1-mile radius is residential.

The IWOR Site was proposed for listing on the National Priorities List (NPL) in October 1999, and the NPL listing was finalized on May 11, 2000. The Site was subdivided into two operable units (OU), one addressing soil contamination throughout the IWOR Site (OU1) and one addressing groundwater contamination (OU2). The U. S Environmental Protection Agency (EPA) issued a record of decision (ROD) for OU1 in November 2002. This ROD addresses OU2.

The EPA is the lead agency at the IWOR Site with the Utah Department of Environmental Quality (UDEQ) acting as a support agency to EPA. Federal Superfund money will be expended for implementation of the remedial action presented in this ROD.

Section 2: Site History and Enforcement Activities

2.1 Site History

Various operations reportedly occurred at the Site. The Site was originally part of a brick manufacturing facility that encompassed about 20 acres. In the 1950s, an asphalt business was operated at the Site. The Site operations began in 1957 and continued for approximately 35 years before closing in May 1993. The Site was originally a trucking business that hauled various petroleum products to customers from the Site. During the 1970s an oil blending business commenced on the property. The operation involved blending green bottoms, purportedly a faction of crude oil with diesel fuel, which was sold for dust control at coal mines.

Over the subsequent years, used oil was treated onsite and was sent to cement facilities for use as fuel in cement kilns. Tanks used in the operations had an unlined secondary surface impoundment. Waste sludge produced in the operations was reportedly disposed of in an offsite landfill, and wastewater that may have remained after the treatment process was boiled off at the site.

The Site owners began dismantling the facility in 1993. Some of the waste was consolidated into a waste pile of approximately 100 cubic yards, located on the east portion of the Site. The remainder of the Site was covered with a couple of inches of gravel-type backfill. Due to unknown operations at the Site, the ground water became contaminated with several solvents, mainly trichloroethylene (TCE), and hydrocarbons. Data indicate that the source of the TCE was processes or equipment located near the laboratory building and former storage tank area, and the underground storage tank.

2.2 EPA and UDEQ Investigations

In May 1992, Enviro Search conducted a soil and groundwater study for the property owners. This study detected volatile organic compounds (VOCs), specifically, trichloroethylene (TCE) and 1,1- dichloroethane (DCA) in the original onsite well (IW-GW-04, relabeled as MW-07 [Figure 2-1] for the remedial investigation [RI]). The Utah Department of Environmental Quality (UDEQ), Division of Solid and Hazardous Waste (DSHW) sampled an onsite sump in January 1995, and detected toluene, tetrachloroethane (PCA), and TCE above maximum contaminant levels (MCLs).

UDEQ Division of Environmental Response and Remediation (DERR) conducted a site inspection (SI) in April 1996 and detected 1,1-DCA and TCE at concentrations above MCLs in the ground water from MW-07 (the original onsite well). All soil samples taken onsite exceeded the Superfund Chemical Data Matrix (SCDM) Cancer Risk Screening Concentrations for one or more constituents. The onsite soil samples contained ethylbenzene, trimethylbenzene, n-butylbenzene, toluene, and 1,2-DCA. Offsite samples exhibited no significant levels of contamination.

DERR also conducted an expanded site investigation (ESI) in June 1998. All onsite soil/source samples exhibited elevated levels of inorganic contaminants, including cadmium, copper, lead, and mercury. Several semi-volatile organic compounds (SVOCs), pesticides, and tentatively identified compounds (TICs) were detected at low, estimated concentrations. Groundwater samples collected from MW-07 had *cis*-1,2- dichloroethene (DCE) and TCE at concentrations exceeding MCLs.

The Site was proposed for listing on the NPL in October 1999 after TCE, *cis*-1,2-DCE , and 1,1-DCA were detected at concentrations exceeding MCLs in 1992, 1995, and 1998 in groundwater samples from monitoring well MW-07 (Figure 2-1). The NPL listing was finalized on May 11, 2000.

In August 2001, the EPA conducted a removal under authorities provided in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The removal addressed conditions that presented an imminent and substantial endangerment to human health and the environment, including the removal and disposal of numerous containers and their contents, laboratory chemicals, and the contents of several above ground tanks.

EPA conducted a Remedial Investigation (RI) at the Site from December of 2001 through June 2004. For the RI, the Site was subdivided into OU1 and OU2. OU1 addressed the near surface soil contamination and potential sources, including tanks, drums, and containers at the Site; while OU2 addressed the vadose zone and groundwater contamination.

The OU1 RI identified the area east of the laboratory as containing high concentrations of total petroleum hydrocarbons (TPH) and VOCs in the zero to 24-inch (in) below ground surface (bgs) soils. In November 2002, EPA signed the ROD for OU1. The selected remedy described in the OU1 ROD involves the establishment of a building requirement to prevent contaminated soil vapors from entering buildings and removal of the underground storage tank (UST).

In order to conduct sampling and keep the investigation on schedule, the UST was removed as part of the OU2 RI in 2003. The human health risk assessment identified TCE, cis-1, 2-DCE, acetophenone, bis (2-ethylhexyl) phthalate, and manganese as contaminants of potential concern (COPCs) (Table 2-1) in ground water. After quantifying the risk presented at the site, the only contaminant of concern (COC) in the IWOR ground water is TCE. TCE is the only contaminant found above health-based levels of concern.

In May 2004 EPA began conducting a treatability study at the Site to evaluate four groundwater treatment alternatives to select the preferred option, and provide data for long-term treatment.

2.3 Enforcement Activities

During the period of operations at the Site, DSHW and the Utah Attorney General's office issued numerous notices of violation and orders for failure to remediate contamination resulting from years of spillage. Earlier violations were issued by Davis County Health Department. The Site had its operating permit revoked on several occasions due to its waste management practices.

EPA began a search for potentially responsible parties (PRPs) in 2000, which is still ongoing. Numerous information request letters have been issued to various parties to help determine PRPs who might be responsible for investigation and cleanup costs incurred at the Site. EPA issued a combined general notice and information request letter to Intermountain Oil Company on February 10, 2000. On March 9 and April 3, 2000, EPA issued information request letters to nine suspected transporters to obtain information regarding their actions as well as information on the generators of the wastes transported to the Site. On October 10, 2000, EPA filed a lien on the former Intermountain Oil Company property.

Section 3: Community Participation

Sections 113 and 117 of CERCLA require public participation. EPA has conducted the required community participation activities through the presentation of the remedial investigation/feasibility study (RI/FS) and the Proposed Plan, a 30-day public comment period, a formal public meeting, and the presentation of the Selected Remedy in this ROD. In addition, several fact sheets mailings were completed during the RI.

Interviews with potentially impacted community members and public officials were conducted in the summer of 2000. Based on the results of these interviews and statutory requirements, a Community Involvement Plan was developed. In March 2001, July 2001, and March 2004, EPA issued fact sheets that summarized the investigation status and described future investigation plans. The EPA also maintains a web page on the EPA Superfund web site (www.epa.gov/region8/superfund/sites/ut) that describes activities at the Site.

The Proposed Plan for IWOR OU2 was issued on June 24, 2004. The RI/FS documents and the Proposed Plan were made available to the public in the Administrative Record located at the EPA Superfund Records Center in Denver, and the Davis County Library, South Branch, at 725 South Main in Bountiful, Utah. Notices of availability of these documents were published on

June 25, 2004, in the *Davis County Clipper*. A public meeting was held on July 1, 2004 at the Bountiful City Hall. The public comment period was from June 24 to July 23, 2004.

Section 4: Scope and Role of Operable Unit

For the remedial investigation and cleanup, the Site was divided into two operable units (OUs):

- OU1 – contaminated soils; and
- OU2 – contaminated ground water.

EPA has already selected the remedy for OU1 in a ROD signed in November 2002. OU1 requires a Land Use Control to control exposure to soil contamination. The specifications of this requirement were formalized in an Environmental Notice and Institutional Control and filed with the Davis County Clerk and Recorder's Office. Under this remedy, any future buildings constructed on the Site are required to have a sub-foundation ventilation system such as what is commonly used to eliminate exposure to radon gas.

For OU2, the subject of this ROD, EPA addresses the contamination of the ground water, and 25 waste containers that remain on Site. Ingestion of ground water extracted from this aquifer poses a potential future risk to human health. The ground water contains TCE at levels above the maximum contaminant levels (MCLs) for drinking water. Improper disposal or management of the containers currently on Site might present unacceptable future risk. The selected remedy will restore the aquifer to beneficial use, and dispose of the remaining containers, eliminating risk to human health from future ingestion of ground water or improper disposal or management of the containers and their contents.

While the OU1 and OU2 RI/FS were ongoing, a removal was conducted under authorities provided in Section 300.415(b)(2) of the NCP. The removal addressed conditions that presented an imminent and substantial endangerment to human health and the environment.

Section 5: Site Characteristics

5.1 Site Conceptual Model

Figures 5-1 and 5-2 illustrate the conceptual models for the Site. Figure 5-1 is a three-dimensional representation of the likely sources of groundwater contamination, the aquifer system, and the general transport and fate processes. Suspected TCE contamination sources were the former UST located south of the laboratory, the sump, and the former aboveground storage tank area to the east of the laboratory.

When a dense non-aqueous phase liquid (DNAPL) such as TCE is released into the subsurface, it moves downward under the force of gravity along preferential pathways (Figure 5-1). Due to the low hydraulic gradient at the Site, any free phase TCE would have primarily a vertical flow component. As the ground water moves around the TCE (recharge through the vadose or

ground water flow), some of the TCE will partition into the ground water to form a plume of dissolved constituent, having a higher lateral flow component.

Figure 5-2, presents how future onsite workers and any onsite future residents may be potentially exposed to ground water via the following pathways:

- Direct ingestion of untreated ground water as drinking water;
- Dermal contact with the water while showering or bathing;
- Inhalation of VOCs that are released from indoor water uses to indoor air; and
- Inhalation of VOCs that are released from ground water and migrate upward through soil into indoor and outdoor air.

Using this model, the baseline human health risk assessment concluded the only potential chemical of concern in ground water contributing risks above EPA's usual level of concern is TCE. The remedy presented in this ROD addresses treatment of the ground water to levels at or below drinking water standards, or MCLs, for TCE (5 µg /L).

A screening level ecological risk assessment was done as part of OU1. The OU1 ecological risk assessment found that risk to plants and animals from onsite contamination is limited and that no species of concern are affected. Since OU2 addresses groundwater, additional ecological risk assessment work was not needed.

5.2 Physical Characteristics of the Site

The two-acre site includes a two-bay garage/warehouse, a laboratory/office space, waste piles, oil-stained soils within a bermed area, and several monitoring wells (Figure 2-1). Most containers, drums, and tanks, have been removed from the Site, including an underground storage tank. There are no items of archeological or historical value located at the Site.

The Site is located in Bountiful City within the Basin and Range Physiographic Province. The Wasatch Mountains are to the east, the Great Salt Lake to the West, and the Oquirrh Mountains to the southwest. The Basin and Range Physiographic Province is comprised of basin-fill deposits, which were eroded from the mountains and deposited in the grabens during Pre-Pleistocene and Pleistocene Epochs.

The Site is located above the 500-year floodplain, has a relatively flat topography with a slight dip to the west-northwest, and has elevations ranging from 4,367 feet (ft) above mean sea level (amsl) in the eastern portion, to 4,358 ft amsl along the western perimeter. Runoff leaving the Site drains to the 500 West storm sewer, located west of the Site and draining into Mill Creek, and ultimately into the Farmington Bay Bird Refuge, a wetland area on the southeastern shore of the Great Salt Lake.

5.3 Summary of OU2 Remedial Investigation

This section summarizes the OU2 RI strategy and findings.

5.3.1 Remedial Investigation Sampling Strategy

EPA conducted the OU2 RI from December 2001 through the spring of 2004. A total of nine monitoring wells were installed as part of the OU2 RI, eight onsite and one offsite. The onsite monitoring wells were completed to various depths and placed up and down gradient of the suspected source areas, as well as along the perimeter of the Site. Groundwater samples were collected quarterly from December 2001 to 2003, and then monthly from January to March 2004.

In addition to groundwater sampling, subsurface soil samples and vapor samples were collected from the Site. Subsurface soil samples were collected as part of well installation and the vadose zone investigation to determine the extent of residual TCE present in the subsurface. The vadose zone investigation was completed during the UST removal to determine the extent of subsurface contamination as a result of the leaky UST. Vapor samples were collected during the treatability study to evaluate the performance of the soil vapor extraction (SVE) as a means for addressing the residual TCE contamination in the vadose zone surrounding the source areas.

All groundwater samples were analyzed for VOCs and SVOCs, dissolved target analyte list (TAL) metals, TPH- gasoline range organics (GRO), and natural attenuation parameters. The ground water TCE results were compared against the Primary National Drinking Water Standard of 5 µg/L to determine the extent of TCE groundwater contamination.

5.3.2 Nature and Extent of TCE in Ground Water

The East Shore Aquifer system in Bountiful has been described as containing shallow (60 to 250 ft bgs), intermediate (250 to 500 ft bgs), and deep (greater than 500 ft bgs) artesian aquifers. The shallow, intermediate, and deep portions of the East Shore Aquifer may be hydraulically connected with one another. The aquifers are interpreted to merge to the west near the Great Salt Lake and are under confining conditions in these areas. Boundaries have not been defined for these systems since they reportedly have neither substantial lithologic differences nor large vertical head differences. The shallow aquifer at the Site is composed primarily of sediments with alternating layers of gravel, sand, poorly sorted mudflow deposits, and clay.

The groundwater flow direction in the shallow aquifer at the Site is generally west-northwest, with static groundwater elevations ranging from 4,256 ft amsl to 4,267 ft amsl, with a very shallow to flat gradient. In general, the highest water levels were measured in the spring and summer months (i.e., March and June 2003), and the lowest water levels were measured in the fall and winter months (i.e., September and December 2003).

Monitoring wells MW-01, MW-02, MW-04, MW-07, and the shallow BarCads™ in MW-09 and MW-10 (Figure 2-1) had at least one TCE detection. (The BarCad™ wells have three sampling depths: upper, mid, and a lower.) Of these monitoring wells, MW-02, MW-04, and MW-07 had TCE concentrations exceeding the MCL, with concentrations as high as 19 µg/L, 12 µg/L, and 160 µg/L respectively (Table 5-1). Even though there is variability for the TCE data available

for MW-02 and MW-04, the data show that concentrations of TCE in these two monitoring wells have increased since the first samples collected in December 2001, as presented in Figures 5-3 and 5-4. Possible explanations for the increase in TCE concentrations as the water level at the Site dropped and stabilized include migration of the "core" of the plume toward these wells or an increase due to less dilution from groundwater recharge.

From the groundwater data collected during this RI, a narrow plume of ground water impacted by TCE can be inferred extending west-northwest from the area around MW-07, as illustrated on the TCE isoconcentration contour map (Figure 5-5). The vertical extent of TCE in the ground water is inferred to extend no deeper than 130 ft bgs because samples from MW-08, which is screened from 130 to 150 ft bgs and installed in proximity to MW-07, show no detections of either TCE or its degradation product, *cis*-1,2-DCE. Also sample results from the middle (approximately 180 ft bgs) and deep (approximately 220 ft bgs) BarCads™ in MW-09 and MW-10 show no detections of either TCE or *cis*-1,2-DCE.

5.3.3 Nature and Extent of TCE in the Vadose Zone

Vadose zone soil samples showed a vadose zone comprised of interbedded sands, clays, and gravels. In addition, the water bearing units were found to be gravelly sands and sandy gravels.

The TCE concentration in the vadose zone ranged from non-detect to 680 micrograms per kilograms (µg/kg), estimated (Table 5-2). The highest concentration for TCE (estimated at 680 µg/kg) was detected in a sample collected from the 10 to 15 ft bgs interval from within the footprint of the UST. Samples from the 10 to 15 ft bgs interval (in the former aboveground tank storage area) and MW-09 (in the former location of the sump) were visibly contaminated; however, the TCE results came back non-detect at 1,600 and 230 µg/kg respectively, possibly masked by the raised detection limits resulting from the high level of contamination. Two visibly contaminated samples collected from the UST excavation also had raised detection limits that possibly masked the TCE results. The only other detects of TCE (Table 5-2) at the Site were from samples collected from:

- UST excavation (TE01) estimated at 7 µg/kg;
- Subsurface soil sample (DP07) at the 15- to 25-ft and 40- to 45-ft intervals, at an estimated value of 5 and 220 µg/kg, respectively;
- Drilling core (MW-10) at 4 µg/kg in the sample collected from 79 to 80 ft bgs;
- Drilling core (MW-08) in the 79 to 80 ft bgs sample, at an estimated value of 1 µg/kg; and
- Drilling core (MW-09) in the 49 to 50, 69 to 70, and 79 to 80 ft bgs samples, all at an estimated value of 2 µg/kg.

The soil saturation limit for TCE was calculated to determine whether the concentration levels detected indicate that the soil pore air and pore water are saturated, indicating that TCE is present in free phase. Subsurface soil TCE results were compared to generic migration to

groundwater soil screening levels to evaluate contaminant leachate potential from soil to ground water.

The soil saturation limit for TCE was calculated at 1183.5 mg/kg using TCE-specific, site-specific and default data. There was no TCE detected at concentrations that exceeded the calculated soil saturation limit of 1183.5 mg/kg; therefore, it is not believed that TCE is present in free phase form at the Site.

To evaluate the potential of TCE leaching out of the soil matrix into the ground water infiltrating at the Site, a conservative generic TCE soil screening level (60 µg/kg) protective of human health was used. A default dilution factor of 20 was used in developing this screening level because it is considered protective for sources up to 0.5 acre in size and is recommended for Sites with deep water tables.

The detected TCE concentrations in the boreholes ranged from 1.0 µg/kg (estimated) to 905.0 µg/kg (estimated). Only borehole DP07 (905.0 µg/kg) had TCE exceeding 60 µg/kg, in samples from the 10 to 15 ft bgs interval. This interval is comprised of a clayey matrix and was also the interval that had visibly contaminated soil in DP08 and MW-09 for which the samples had elevated detection limits, which possibly masked the TCE concentration in these samples. Field screening PID results also indicated that the 10 to 15 ft interval in DP07, DP08, and MW-09 had the highest total organic vapor concentrations.

The 10 to 15 ft interval surrounding DP07 has the potential to leach out of the soil matrix into the ground water infiltrating at the Site. The TCE detected below the 10 to 15 ft interval was orders of magnitude lower than the TCE concentration in the 10 to 15 ft interval, indicating that the clayey matrix retards the downward migration of TCE. Also, the ratio of TCE/*cis*-1,2-DCE below the 10 to 15 ft interval is smaller than 1 (0.05-0.6), suggesting that the TCE is getting transformed with depth. These two factors, combined with the significant dilution and attenuation that occurs due to the travel distance required to reach the water table (typically around 100 ft bgs) and the presence of intermittent clay layers, suggest that the 10 to 15 ft interval will not be a significant long-term source of TCE contamination to the ground water.

5.3.4 RI Conclusion Summary

The likely sources of contamination are in the areas of the former UST located south of the laboratory, the sump, and the former aboveground storage tank area to the east of the laboratory (Figure 2-1). TCE was detected in the subsurface soil as deep as 80 ft bgs, but the majority of the contamination mass is contained in a clay layer that exists at 10 to 15 ft bgs, where the highest TCE concentrations were detected. The contamination in the vadose zone is interpreted to cover an area no larger than 700 square feet (ft^2), with a maximum depth of 80 ft bgs.

The extent of the groundwater contamination is interpreted to cover an area no larger than 8,000 ft^2, and no deeper than 130 ft bgs, and remains close to the probable source areas. Samples collected from monitoring wells screened deeper than 130 ft bgs indicate the absence (or below detection limit concentrations) of TCE deeper within the aquifer. The presence of intermittent clay layers has prevented the bulk of the contamination plume from migrating vertically

beyond a depth of 130 ft bgs. Factors limiting the lateral plume migration include the geologic conditions and the significantly flat hydraulic gradient at the Site.

Section 6: Current and Potential Future Groundwater Uses

The Site is currently zoned for commercial light industrial use but is not actively in use at the time this ROD was prepared. The Site is owned by two entities, Kemar Corporation which owns the western third of the Site and Intermountain Oil Company that owns the eastern two thirds of the Site. The caretaker and owner of several items stored in the onsite garage visits the Site periodically.

The Site is bordered by residential properties to the north and east. The property to the south of the Site and fronting 500 West is a partially developed commercial property. One residence and another commercial property lie between the Site and 500 West.

Due to its location, the Site should be considered as a potential residential area for future land use. Currently, no one is using this portion of the aquifer for drinking water. However, the State of Utah considers the ground water a potential drinking water source. It is not possible to determine when the upper portion of the aquifer may be used for a drinking water source.

Section 7: Summaries of Site Risks

Both baseline human health and ecological risks were evaluated at the IWOR for OU1. The results of these risks assessments were presented in the ROD for OU1.

A baseline human health risk assessment (BHHRA) was conducted for ground water under OU2. This BHHRA was completed in April 2004. The only contaminated of concern identified by the BHHRA was TCE. The detailed human health risk assessment calculations of cancer and non-cancer risks from exposure to ground water concluded the following main points.

- The only chemical that contributes risk above the EPA's usual level of concern (Hazard Quotient (HQ) = 1, cancer risk = 1 in 10,000) to either workers or future residents is TCE. All other COPCs contribute risks that are below the EPA's usual level of concern.

- Non-cancer risks from TCE are above a level of concern (HQ > 1) to current or future on-site workers only in MW-07. For hypothetical future on-site residents, non-cancer risks from TCE are above a level of concern in Wells MW-02, MW-04, and MW-07.

- Cancer risks from TCE are above the EPA's usual level of concern (1 in 10,000) to both workers and hypothetical future on-site residents in Wells MW-02, MW-04, and/or MW-07 (depending on which cancer slope factors are used). Total reasonable maximum exposure (RME) cancer risk to residents also exceeded 1 in 10,000 in Wells MW-08 and MW-010, depending on which slope factors are assumed for TCE.

- For non-cancer risk, the exposure pathway of chief concern is ingestion, with a relatively small contribution from inhalation. For cancer risks, the relative contribution of oral and inhalation exposure depends upon which slope factor values are used.

- The risk from inhalation exposure is determined almost entirely by TCE released from indoor uses of water, with only a small contribution due to intrusion of TCE vapors from ground water via soil.

At the Site, available data indicate that potential risks to current or future on-site workers and hypothetical future on-site residents from exposure to ground water are due almost entirely to the presence of TCE. The locations of chief concern due to TCE are wells MW-02, MW-04, and MW-07. Risks are contributed both by ingestion of TCE in drinking water and inhalation of TCE released from indoor water uses into indoor air. Risks from intrusion of TCE through soil into indoor air are minimal. Currently, the oral and inhalation cancer slope factors for TCE are under debate. Hence, the cancer risk estimates for TCE are uncertain and may be subject to revision as new toxicological data or evaluations become available. Additionally, it is currently being debated whether TCE is a possible or probable human carcinogen. Given all these factors, the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Section 8: Remedial Action Objectives

The ground water addressed by OU2 at the Site is a potential future source of drinking water. The goal is to protect potential future residents or workers from risks associated with the possible ingestion or inhalation of vapors from the ground water. The main cleanup objectives are:

- Restore the aquifer to beneficial use (drinking water standards) within a reasonable time frame;

- Prevent exposure to contaminated ground water through ingestion of contaminated ground water, or inhalation of vapors during use; and

- Prevent the future contamination of ground water that is currently uncontaminated.

The most stringent standards for drinking water are the MCLs defined in the Clean Water Act. As the only COC for ground water is TCE, treatment of the ground water to drinking water standards for TCE concentrations (at or below 5 µg /L) would restore the aquifer to beneficial use.

The goal of reducing further groundwater contamination has been accomplished through the removal of contamination sources. Since the source area and soils contamination are addressed in OU1, there are no soil remedial action objectives (RAOs) for OU2.

Section 9: Descriptions of Alternatives

The process options for remediation of contaminated ground water at the IWOR Site have been combined into five remedial alternatives. These alternatives are:

- Alternative GW-1: No Action;
- Alternative GW-2: Groundwater Extraction and Treatment;
- Alternative GW-3: Soil Vapor Extraction (SVE), and Groundwater Extraction and Treatment;
- Alternative GW-4: Air Sparging, SVE, and Groundwater Extraction and Treatment; and
- Alternative GW-5: Dual Phase Extraction (DPE) and Treatment.

These proposed alternatives have been formulated according to the NCP Section 300.430 (e) and are intended to meet RAOs to varying degrees. All the alternatives, except for the No Action Alternative, have common components. These common components are:

- Land Use Control, or institutional control. The land use control will prevent the installation of a water well on the property until drinking water standards are met in the ground water.
- Monitoring. A monitoring plan to evaluate the effectiveness of the remedy will be developed and implemented. The plan will likely include sampling at least four wells monthly for the first six months, and quarterly thereafter.
- Treatment and Discharge. A treatment system using granulated activated carbon (GAC) will be constructed to treat the extracted ground water. The treated water will be discharged, most likely to a storm water sewer system.

The alternatives considered are described below. The capital cost, annual operation and maintenance cost, present worth costs, and estimated years to achieve RAOs are presented in Table 9-1. A discount factor of 7 percent over five years was used to determine the present worth costs.

9.1 Alternative GW-1: No Action

Alternative GW-1 contains no remedial actions addressing the groundwater plume at the Site. The purpose of providing a no action alternative is to provide a baseline against which the other remedial alternatives can be compared.

9.2 Alternative GW-2: Groundwater Extraction and Treatment

This alternative provides for the active restoration of the aquifer through extraction and treatment of ground water from existing monitoring wells MW-02 and MW-04. The pumping

performed will also serve to limit offsite migration of contamination during restoration. It is estimated it would take up to five years to achieve RAOs using this alternative.

9.3 Alternative GW-3: SVE, and Groundwater Extraction and Treatment

This alternative provides for the active restoration of the aquifer through soil vapor extraction (SVE) at MW-07, and groundwater extraction and treatment at MW-02 and MW-04. A vacuum blower skid consisting of vapor/liquid separator, air filter, vacuum blower, and associated controls and instrumentations will be used to extract vapor from MW-07 to remove residual TCE from the unsaturated soil. A vacuum blower will be used to create a negative pressure for vapor removal. Off-gas treatment via vapor phase GAC will be used to treat extracted vapor if needed. Groundwater extraction will be accomplished as described in GW-2. The common components listed previously would be implemented. It is estimated it would take up to five years to achieve RAOs using this alternative.

9.4 Alternative GW-4: Air Sparging, SVE, and Groundwater Extraction and Treatment

This alternative provides for the active restoration of the aquifer through air sparging at MW-08, SVE at MW-07, and groundwater extraction and treatment at MW-02 and MW-04. The air sparging well is tied into the discharge of an air compressor that can transfer up to 15 scfm at 15 psi into the air sparging well. The soil vapor is then collected through MW-07 and moved to the vapor treatment system described in Alternative GW-3. Any condensate collected from the vapor/liquid separator is treated in a small liquid phase GAC unit. Groundwater extraction will be accomplished as described in Alternative GW-2. The common components listed previously would be implemented. It is estimated it would take up to four years to achieve RAOs using this alternative.

9.5 Alternative GW-5: Dual Phase Extraction and Treatment

This alternative provides for the active restoration of the aquifer through dual phase extraction (DPE) at MW-02 and MW-04. DPE involves groundwater extraction and SVE through the same well. Ground water will be extracted from both DPE wells, effectively dewatering the capillary fringe, and a vacuum blower will be used to apply high vacuum to remove the residual TCE from the unsaturated soil. Vapors from both DPE wells will be transferred to the same vapor treatment system described in Alternative GW-3. Groundwater extraction will be accomplished as described in Alternative GW-2. The common components listed previously would be implemented. It is estimated it would take up to four years to achieve RAOs using this alternative.

9.6 Additional Supplement to the Alternatives

There are 25 containers in the garage that were not addressed during the removal action that was completed in 2001. These containers do not present a human health risk in their current state. Many are one or 5-gallon containers and many contain old industrial paint.

However, if not managed or disposed of properly, the containers and their contents could present a risk. Additionally the condition of some of the containers is deteriorating. Due to their characteristic or chemical contents, most of the containers would be classified as a hazardous waste for disposal purposes.

In order to assure the proper management and disposal of the containers and their contents, a supplement to any of the identified alternatives (except the no action alternative) includes disposing of these containers and their contents. Further information on these containers and their content can be found in the OU1 RI and the administrative record for OU2. The disposal should not add significant cost to any of the alternatives.

Section 10: Comparative Analysis of Alternatives

Table 10-1 presents a comparative analysis of each of the four alternatives including the following:

- Protection of human health and the environment;
- Compliance with ARARs;
- Short-term effectiveness;
- Long-term effectiveness;
- Reduction of toxicity, mobility, or volume through treatment;
- Implementability; and
- Present Worth Cost.

10.1 Overall Protection of Human Health and the Environment

As shown in Table 10-1, all alternatives except the No Action Alternative provide protection of human health and the environment by preventing exposure to contaminated ground water through treatment of the contamination.

10.2 Compliance with ARARs

All the alternatives except the No Action Alternative would comply with ARARs. Identified ARARs include Water Quality and Drinking Water Standards. The No Action Alternative would not meet ARARs. (The ARARs identified for the selected remedy in Tables 13-1 and 13-2 include the ARARs considered for all the alternatives.)

10.3 Short-Term Effectiveness

All the alternatives would have little impact on workers and the surrounding community during the construction phase. Alternatives GW-4 and GW-5 would effectively meet cleanup goals over a shorter period of time than the other alternatives.

10.4 Long-Term Effectiveness

Alternatives GW-2 through GW-5 provide long-term effectiveness and permanence by treating the ground water. Under Alternatives GW-4 and GW-5, the cleanup goals should be reached sooner than the other alternatives.

10.5 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives GW-2 through GW-5 would reduce the toxicity and volume of the contamination through treatment. These alternatives would also help contain the contaminated ground water, thereby reducing contaminant mobility. Alternative GW-1, No Action, would not reduce the toxicity, mobility, or volume of the contamination.

10.6 Implementability

Alternative 1, No Action, is easy to implement, as nothing needs to be done. Alternative GW-2 through GW-5 should be easy to implement. These alternatives involve commonly used technologies and the same packaged treatment system.

10.7 Present Worth Cost

There are no costs associated with the No Action Alternative except for the cost associated with a review every five years. The other alternatives have the same cost for a 5-year review.

Alternative GW-4 has the highest capital and operation and maintenance cost. GW-2 has the lowest capital and operation and maintenance cost. GW-3 and GW-5 have the same operation and maintenance cost. The present worth cost of GW-4 and GW-5 is lower than the other two alternatives because cleanup should be achieved sooner. Although GW-5 has the second highest capital cost, it will take less time to reach the cleanup goal. Thus, the present worth cost of GW-5 is the lowest of all the remedies, except for the No Action Alternative.

10.8 State and Community Acceptance

The State of Utah concurs with the selected remedy. Only two people's comments were received during the public comment period. Both of these comments were stated during the public meeting. One suggested that perhaps nothing more than groundwater monitoring needed to be done at the Site. The other comment did not directly relate to the cleanup alternatives that were presented. Therefore, due to the lack of community concern about the cleanup proposal, it can be assumed that the community is not opposed to the selected remedy.

Section 11: Principal Threat Waste

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site wherever practicable (NCP 300.40. (a) (1) (iii) (A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. The manner in which principal threat wastes are addressed generally will determine whether the statutory preference for treatment as a principal element of a remedy is satisfied.

Examples of principal threat wastes include, but are not limited to the following:

Liquid source material – waste contained in drums, lagoons or tanks, free product in the subsurface such as non-aqueous phase liquids (NAPLs) containing contaminants of concern. Ground water is generally excluded.

Mobil source material - surface soil or subsurface soil containing high concentrations of chemicals of concern that are mobile due to wind entrainment, volatilization, surface runoff or subsurface transport.

Highly toxic source material – buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

IWOR OU2 does not contain a principal threat waste.

Section 12: Selected Remedy

12.1 Detailed Description of the Selected Remedy

The EPA's selected remedy is a combination of Alternatives GW-2 and GW-5, plus the disposal of the containers in the garage. The selected remedy combines dual phase extraction (DPE) and groundwater pump and treatment to optimize the cleanup. Additionally, the containers in the garage would be disposed of properly so they do not present a risk in the future.

Where effective in removing contaminated vapors as well as contaminated ground water, DPE will be used. Where, or when, there are no significant contaminated soil vapors recovered through DPE, groundwater pump and treatment will be used. The cleanup goals are the MCLs. The Operation and Maintenance (O&M) Plan developed during the remedial action will detail the criteria and options for determining when the cleanup goals are met.

The cost of the combined remedy will be the same as the cost of GW-5 with the addition of the container disposal. The DPE technology that allows the cleanup goals to be achieved in 4 years will be used where effective. A simpler groundwater pump and treatment technology will be used where there are no contaminated soil vapors. Disposal of the containers, will add little to the overall cost. Thus, the cleanup goals should be achieved in 4 years with the cost as

presented in GW-5. These cost are summarized in Table 9-1 detailed in Table 12-1. Components of the selected remedy are:

- Land Use Control, or institutional control. The land use control will prevent the installation of a drinking water well on the property until drinking water standards are met in the ground water.

- Monitoring. A monitoring plan to evaluate the effectiveness of the remedy will be developed and implemented. The plan will likely include sampling at least four wells monthly for the first six months, and quarterly thereafter. Analytical parameters will include TCE and potential degradation products.

- Groundwater and vapor extraction. The ground water will be pumped from two wells (MW-02 and MW-04). A DPE system will be used at MW-04. DPE involves groundwater extraction and SVE through the same well.

- Groundwater Treatment and Discharge. A treatment system using granulated activated carbon (GAC) will be constructed to treat the extracted ground water. The treated water will be discharged, most likely to a storm water sewer system. The effluent will meet the criteria to the receiving facility, e.g. the city for the storm drain.

- Vapor Treatment. Off-gas treatment via vapor phase GAC will be used to treat extracted vapor if the vapors are above state standards.

12.2 Summary of the Rationale for the Selected Remedy

The groundwater concentrations of TCE in the ground water at the Site have been slowly increasing over time. The ground water is moving slowly in the northwest direction and contamination is moving off-site in the ground water. Although potential contamination sources have been removed it is not known how much more the groundwater contamination may increase or when (or if) the ground water may be used as a drinking water source. A combined GW-2 and GW-5 remedy:

- Meets the threshold cleanup evaluation criteria (overall protection of human health and the environment, and compliance with ARARs).
- Provides long-term effectiveness and permanence for future uses of the property.
- Enables safe future use of the ground water by restoring it to beneficial use within a reasonable time frame.
- Addresses the source areas through groundwater and soil vapor extraction.
- Prevents further migration of the contaminated groundwater plume.
- Is readily implementable.
- Is cost effective.

The selected remedy provides the quickest method of achieving cleanup goals with the least cost. It uses relatively simple and effective technologies and treatment components.

12.3 Expected Outcomes of the Selected Remedy

The expected outcomes of the selected remedy are:

- Containment of the current groundwater contamination;
- Prevention of exposure to contaminated ground water above drinking water standards through use of an institutional control;
- Meeting TCE drinking water levels (MCL of 5 μg/l) within 4 years allowing for unlimited use of the ground water at the Site; and
- Prevention of future contamination through treatment of soil vapors in the source areas.

Section 13: Statutory Determinations

Under CERCLA 121 and the NCP, EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless statutory waivers are justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous waste as a principal element of the selected remedy. The following sections discuss how the selected remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The selected remedy is protective of human health as its treatment component eliminates risk of exposure from the three pathways outlined in the conceptual Site model. By treating the TCE in ground water, risks to human health from direct ingestion of the ground water when used as a drinking water source, inhalation of TCE through indoor water use, and inhalation of TCE that migrate up through the soil are eliminated.

13.2 Compliance with ARARs

By extracting and treating both vapors and ground water to standards outlined in the chemical and action specific ARARs determined for OU2, the selected remedy is compliant with these ARARs as shown in Table 13-1 and 13-2.

13.3 Cost Effectiveness

The selected remedy is cost effective. In making this determination, the following definition set forth in the NCP was used: " A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (40 CFR §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfy the threshold criteria. Overall

effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs, and, hence, this alternative represents a reasonable value for the money to be spent.

All of the alternatives evaluated for OU2 ground water are evaluated equally in long-term effectiveness and permanence, and reduction of toxicity, mobility, and volume of waste. A summary evaluation presenting the cost of the selected remedy (alternative GW-5) is presented in Table 12-1.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, the selected remedy provides the best trade-offs in terms of the five balancing criteria while also considering the statutory preference for treatment as a principal element and bias against off Site treatment and disposal, and considering State and community acceptance.

13.5 Preference for Treatment as a Principal Element

The selected remedy utilizes granular activated carbon (GAC) to treat groundwater contamination and vapors (if needed). Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

13.6 Five-Year Review Requirements

Because this remedy should not result in hazardous substances or pollutants or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure to ground water, a statutory review will not be required. It is expected that the remedial action objectives (cleanup levels) will be reached within five years. If the remedy takes more than five years to attain remedial action objectives, a policy review may be conducted within five years of construction completion to ensure that the selected remedy is, or will be, protective of human health and the environment.

Section 14: Documentation of Significant Changes

The Proposed Plan for OU2 was released for public comment in June 2004. The Proposed Plan identified the combination of Alternatives GW2 and GW5, as the preferred alternative for treating OU2 groundwater contamination. Additionally, the Proposed Plan also included the proper disposal of the containers in the garage as part of the preferred alternative. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy as described in the Proposed Plan were necessary or appropriate.

Figures

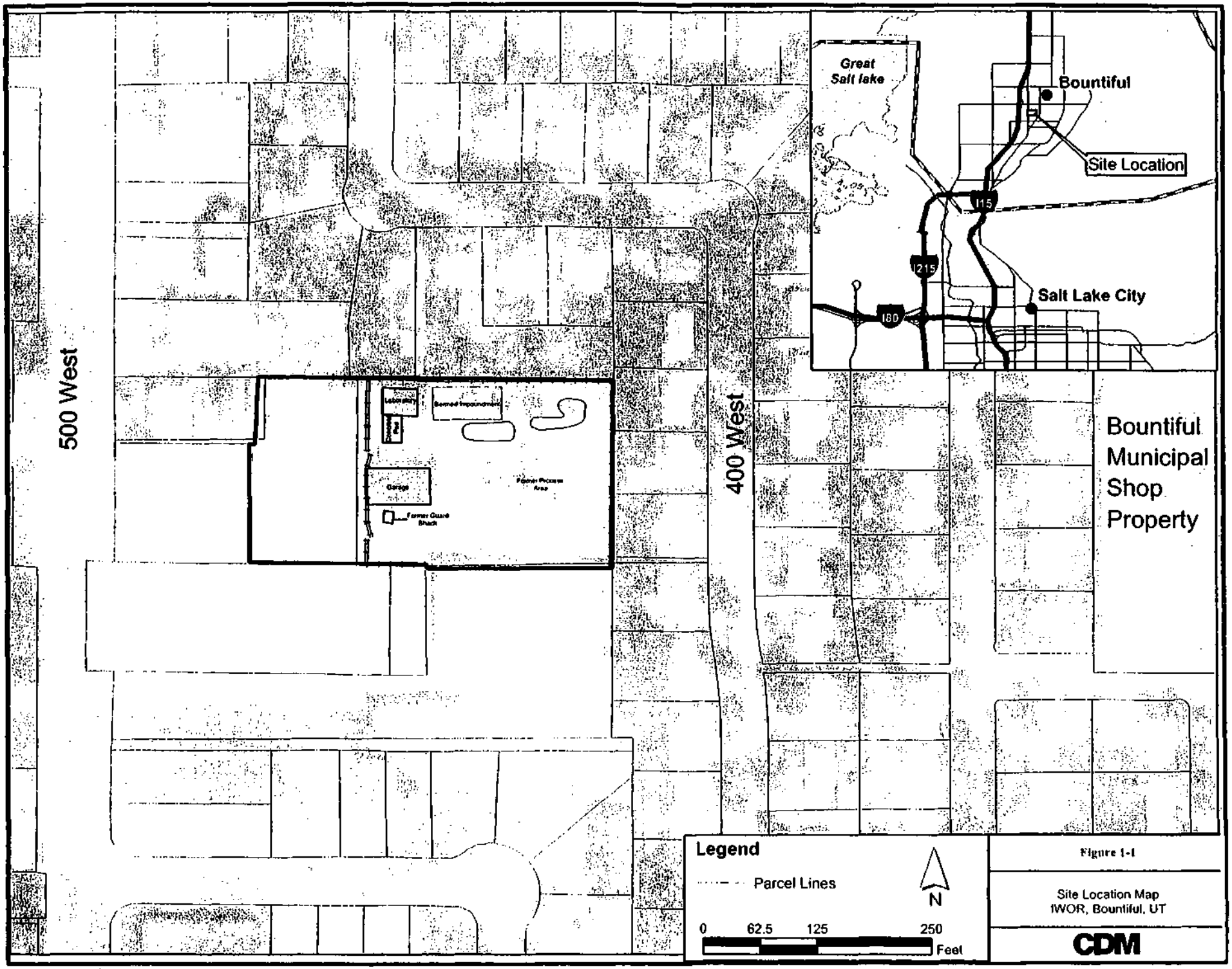
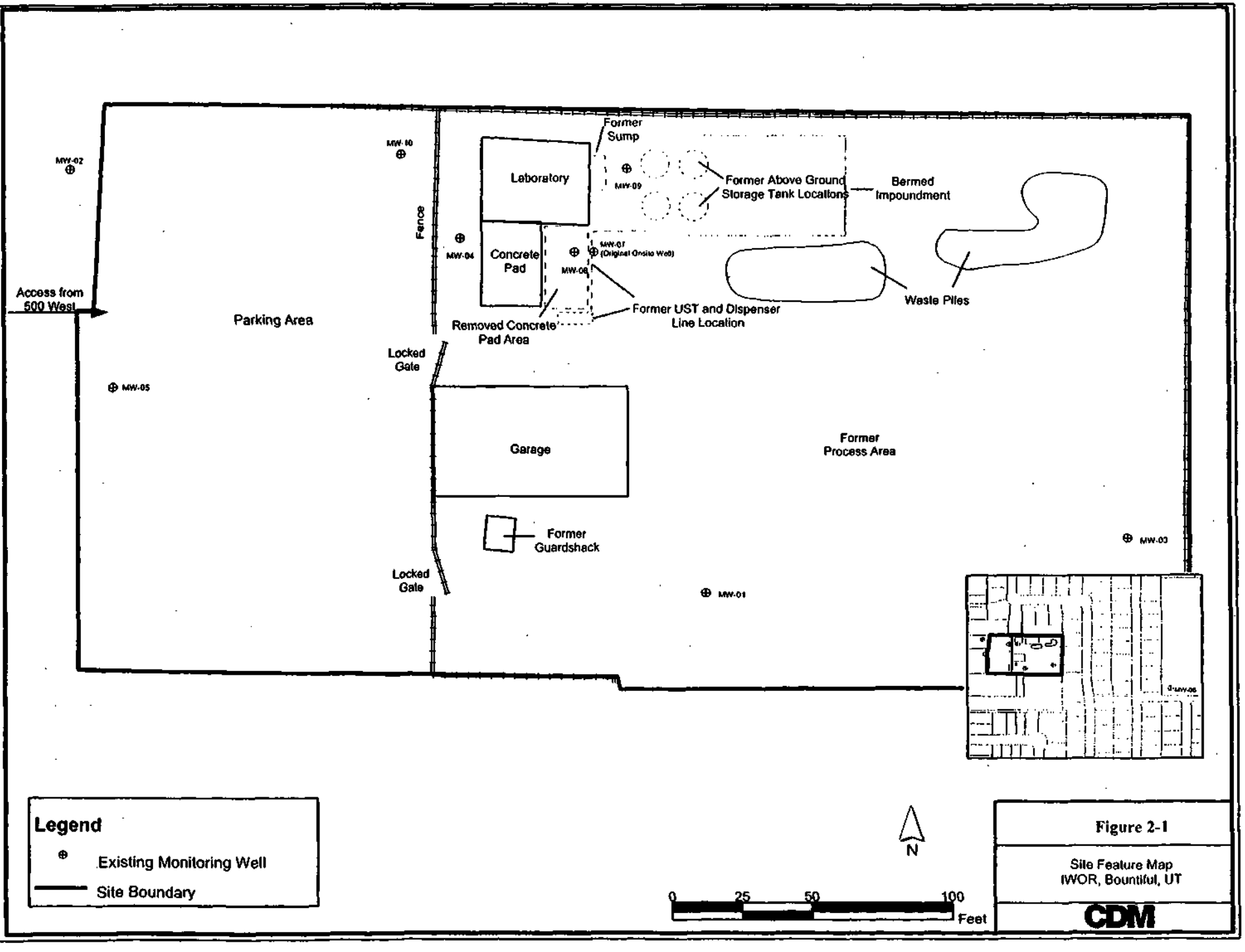


Figure 1-1

Site Location Map
IWOR, Bountiful, UT

CDM

Map Filename: Figure 1-1SiteLocationRev1.mxd 6/08/2004


MW-02
MW-10
Former Sump
Laboratory
MW-09
Former Above Ground Storage Tank Locations
Bermed Impoundment
Fence
MW-04
Concrete Pad
MW-07 (Original Onsite Well)
MW-08
Access from 500 West
Parking Area
Removed Concrete Pad Area
Former UST and Dispenser Line Location
Waste Piles
Locked Gate
MW-05
Garage
Former Process Area
Former Guardshack
MW-03
Locked Gate
MW-01
Legend
Existing Monitoring Well
Site Boundary
N
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25
50
100
Feet
Figure 2-1
Site Feature Map
IWOR, Bountiful, UT
CDM
Map Filename: Figure1-2_sitefeatures

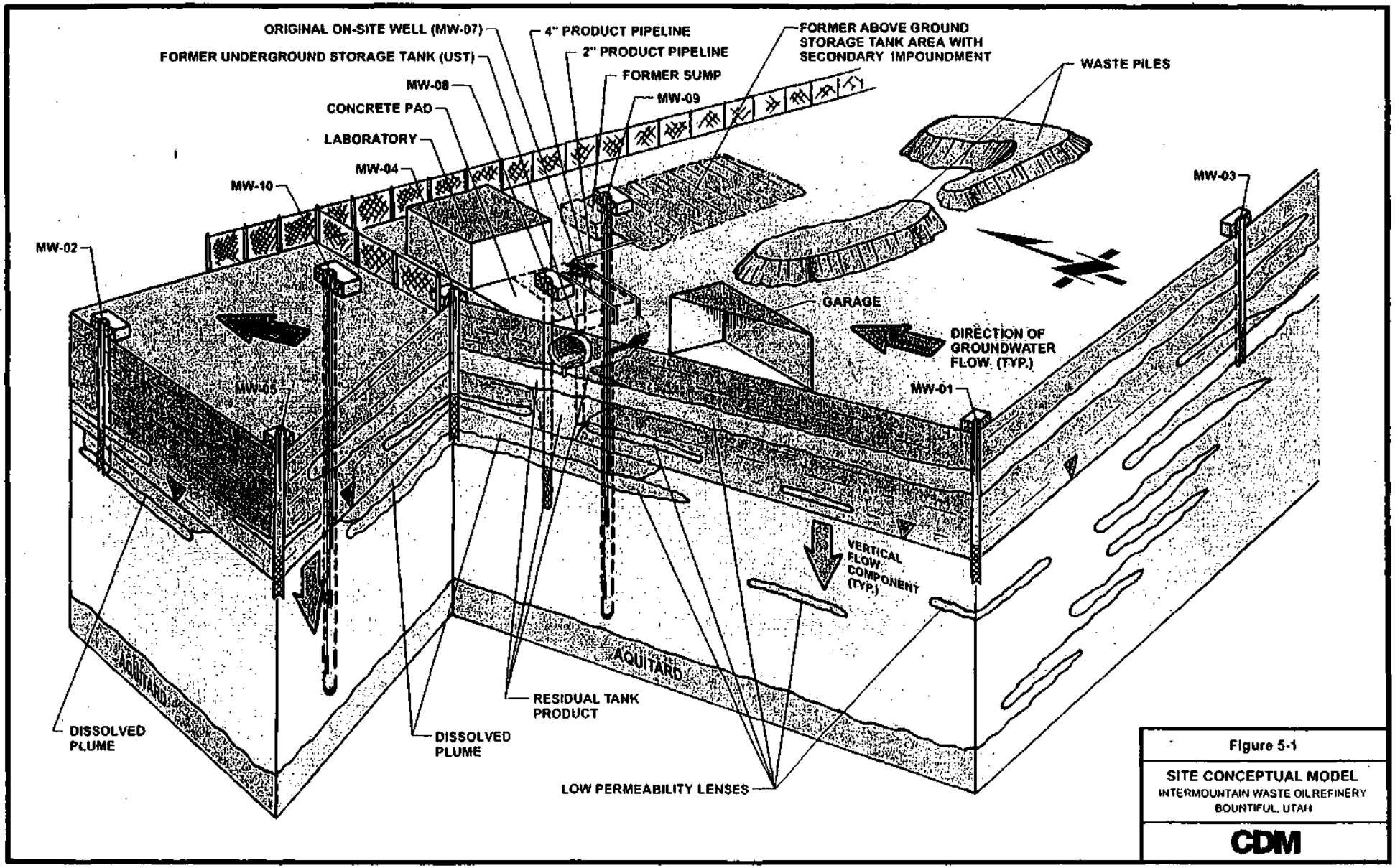
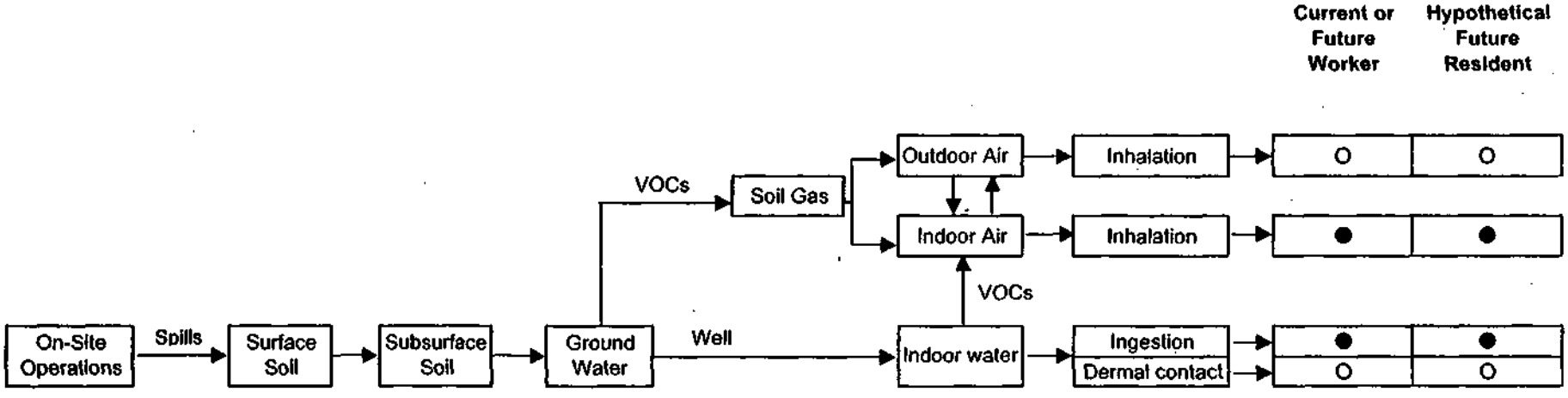


Figure 5-1

SITE CONCEPTUAL MODEL
INTERMOUNTAIN WASTE OIL REFINERY
BOUNTIFUL, UTAH

CDM

FIGURE 5-2: CONCEPTUAL SITE MODEL FOR HUMAN EXPOSURE TO GROUNDWATER

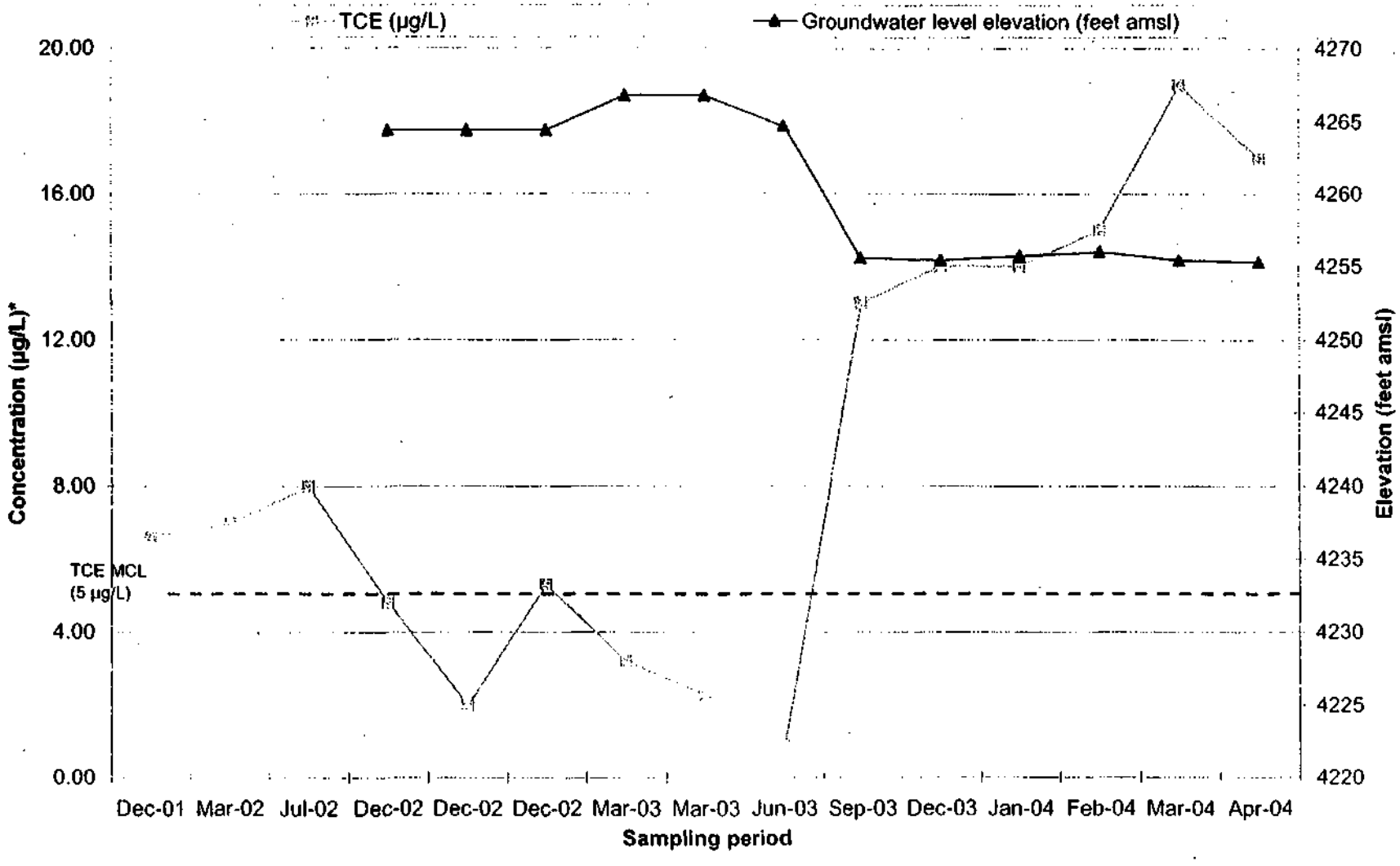


KEY

O	Pathway is or might be complete, but exposure is considered to be minor; qualitative evaluation
●	Pathway is or might be complete and could be significant; quantitative evaluation

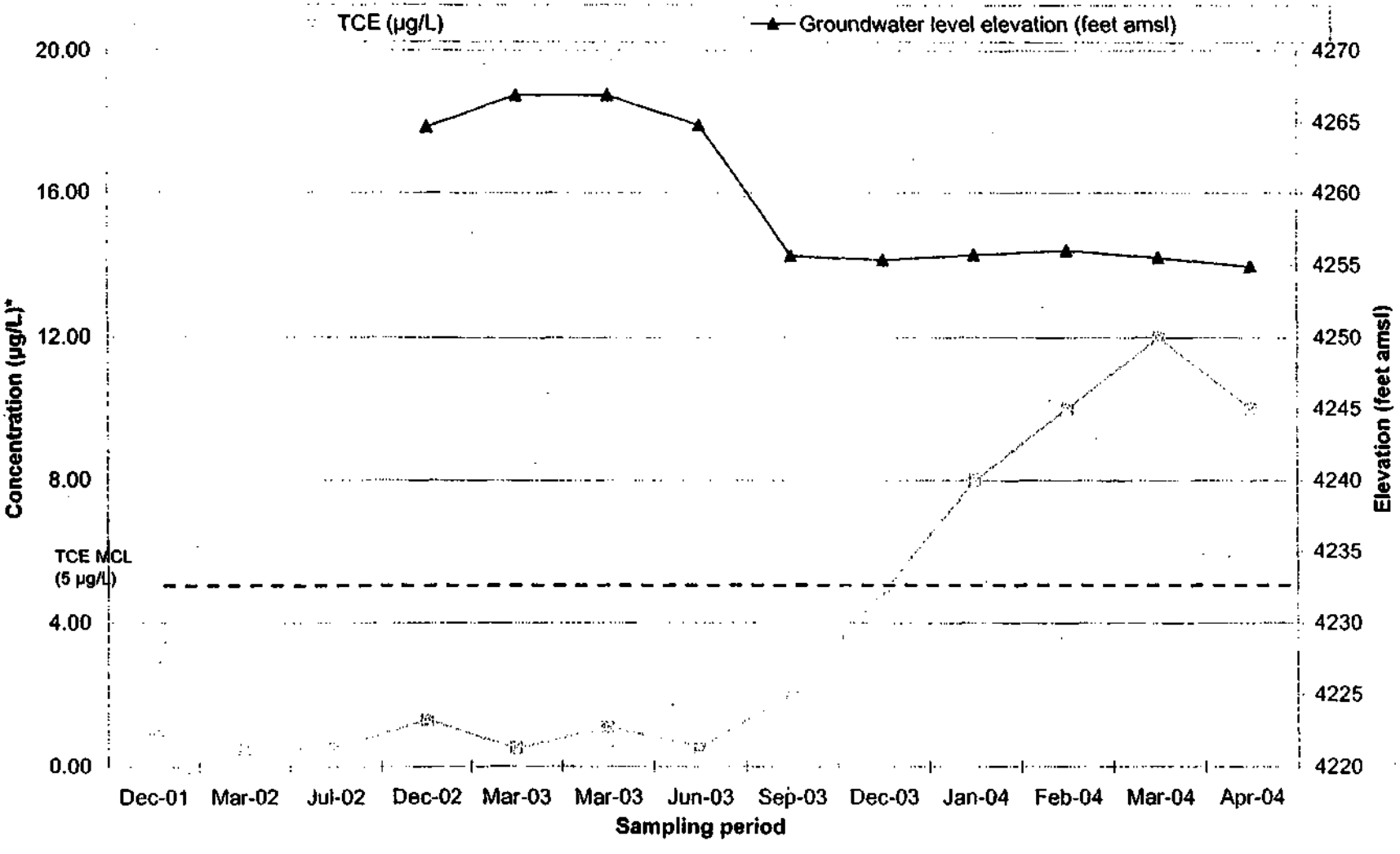
Abbreviations:
VOC = Volatile organic chemical

Figure 5-3: TCE Concentrations vs Groundwater Elevations at Monitoring Well MW-02, IWOR OU2.



Notes: TCE - trichloroethene; IWOR - Intermountain Waste Oil Refinery; OU - Operable Unit; amsl - above mean sea level; µg/L - micrograms per liter; MCL - maximum contaminent level
* For consistency, all results qualified as non-detect are assigned a value of 0.5 µg/L even though the reporting limits for some sampling periods were 5.0 µg/L or 10.0 µg/L and values were qualified as non-detect at 5.0 µg/L or 10.0 µg/L.

Figure 5-4: TCE Concentrations vs Groundwater Elevations at Monitoring Well MW-04, IWOR OU2.



Notes: TCE - trichloroethene; IWOR - Intermountain Waste Oil Refinery; OU - Operable Unit; amsl - above mean sea level; µg/L - micrograms per liter; MCL - maximum contaminent level

* For consistency, all results qualified as non-detect are assigned a value of 0.5 µg/L even though the reporting limits for some sampling periods were 5.0 µg/L or 10.0 µg/L and values were qualified as non-detect at 5.0 µg/L or 10.0 µg/L.

ROD Figure 5-4

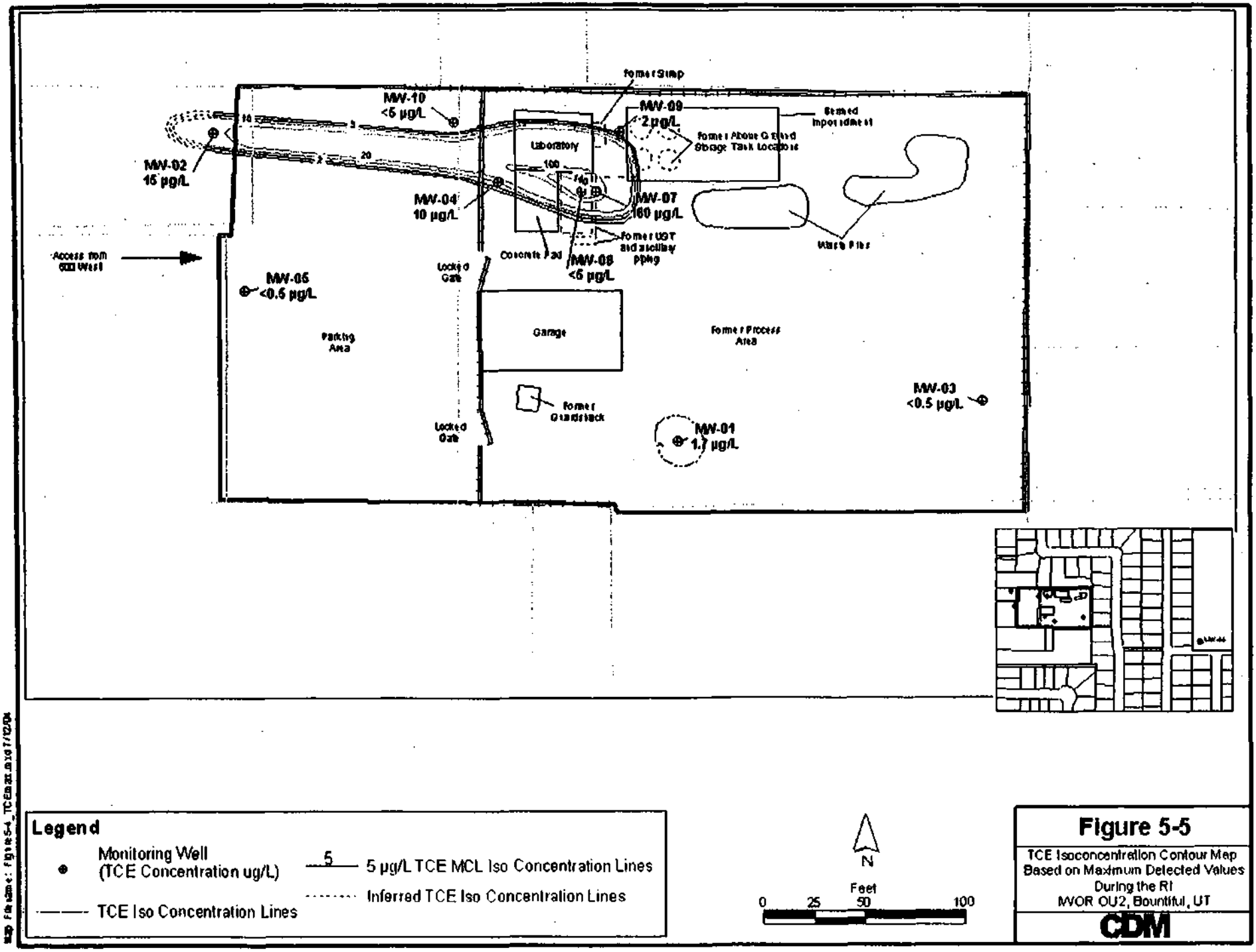


Figure 5-5

TCE Isoconcentration Contour Map
Based on Maximum Detected Values
During the RI
MWR OU2, Bountiful, UT

CDM

Tables

Table 2-1: Quantitative Contaminants of Potential Concern (COPCs) in Groundwater, IWOR OU2

Category	Chemical Name
Volatile Organic Compounds (VOC)	1,1,2-Trichloroethane
	1,2-Dichloroethane
	Bromoform
	Chloroform
	cis-1,2-Dichloroethene
	Dibromochloromethane
	Trichloroethene
Semi-VOC (SVOC)	bis(2-Ethylhexyl)phthalate
	1,2,4-Trichlorobenzene
	Hexachlorobutadiene
PAH	Naphthalene

Notes:
COPC – contaminant of potential concern
VOC – volatile organic compounds
SVOC – semi-volatile compounds
PAH – polycyclic aromatic hydrocarbon

Source: Syracuse Research Corporation (SRC). 2004. Draft Baseline Human Health Risk Assessment for the Intermountain Waste Oil Refinery Site, Bountiful, Utah. Operable Unit 2 (Groundwater). April.

Table 6-1: Summary of Detected VOC, SVOC, and TPH Groundwater Sample Results, IWOR OU2

Analyte (ug/L)	Well ID	MW-01													MW-02																								MW-03												
	Sampling Event	Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02	Mar-03		Jun-03	Sep-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02			Mar-03		Jun-03	Sep-03	Dec-03		Jan-04		Feb-04		Mar-04		Apr-04		Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02	Mar-03			Jun-03	Sep-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04
	Pump Elevation (ft amsl)	nd	nd	nd	4263.3	4264.8	4243.8	4253.8	4248.3	4249.8	4250.5	4248.8	4247.8	4249.6	nd	nd	nd	4262.01^	4251.0	4243.0^	4253.0	4246.0	4252.0	4248.0	4247.0	4247.0^	4247.0	4247.01^	4246.0	4246.0^	4246.0	4246.0^	4246.0	4246.0^	nd	nd	nd	4262.6	4256.5	4267.5	4247.5	4268.0	4251.5	4250.5	4250.5	4250.5	4250.5	4250.5
1,1,1-TCA		10 U	10 U	10 U	0.21 J	0.50 U	0.22 J	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	0.84 J	10 U	10 U	0.39 J	0.21 J	0.56	0.50	0.46 J	0.50 U	0.55	0.64	0.75	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.41 J	0.39 J	0.30 J	0.39 J	0.50 U	0.50 U	0.29 J	5 U	5 U	5 U	5 U
1,1-DCA		10 U	10 U	10 U	0.25 J	0.50 U	0.50 U	0.50 U	0.18 J	0.57	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.27 J	0.50 U	0.26 J	0.50 U	0.50 U	0.50 U	0.78	0.93	0.86	5 U	5 U	5 U	5 U	1 J	1 J	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
PCE		nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
TCE		0.84 J	10 U	10 U	1.70	0.62	0.54	0.54	0.46 J	1.2	5 U	5 U	2 J	1 J	6.62 J	7.4	8.4	4.90	2.6	6.2	2.2	2.3	0.96	12	14	18	14	14	16	16	18	18	17	16	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
cis-1,2-DCE		10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	2.27 J	3 J	3 J	2.10	0.67	2.1	0.77	0.83	0.40 J	6.1	6.4	8.3	8	9	11	10	16	14	14	13	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
Acetophenone		0.41 J	10 U	nd	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U	5 U	5 U	5 U	5 U	0.30 J	10 U	nd	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.46 J	10 U	nd	0.50 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5 U	5 U	5 U	5 U
Benzene		nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
Methylene Chloride		10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	10 U	2 J	2 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	1 J	2 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U
MTBE		nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 UJ	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	5 U	5 UJ	5 U	5 U
Bromoform		10 U	2 J	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	8 J	5 U
Chloroform		10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 UJ	5 U	5 U	10 U	10 U	10 U	0.18 J	0.50 U	0.26 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 UJ	5 UJ	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 UJ	5 U	5 U
TPH-GRO		1.1 U	1.1 U	1.1 U	35 U	250 U	250 U	50 U	50 U	50 UJ	50 U	50 U	50 U	50 U	1.1 U	1.1 U	1.1 U	74 UJ	27 UJ	60 UJ	250 U	50 U	58 U	50 U	50 UJ	50 UJ	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1.1 U	1.1 U	1.1 U	43 UJ	38 U	250 U	250 U	50 U	50 U	50 UJ	50 U	50 U	50 U	50 U
bis(2-Ethylhexyl)phthalate		nd	nd	nd	5.0 U	2.4 J	1.9 J	5.0 U	5.0 UJ	5.0 UB	2.0 J	10 U	10 U	10 U	nd	nd	nd	5 U	5 U	5.0 U	5.0 U	10 U	5.0 U	5.0 U	5.0 UB	5.0 UB	11 U	11 U	10 U	10 U	10 U	10 U	10 U	10 U	nd	nd	nd	5.0 U	5.0 U	2.5 J	1.9 J	5.0 U	5.0 UJ	5.0 UB	11 U	10 UJ	10 U	10 U

Analyte (ug/L)	Well ID	MW-04														MW-05														MW-06																				
	Sampling Event	Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02*		Mar-03*		Jun-03*	Sep-03*	Dec-03		Jan-04		Feb-04		Mar-04		Apr-04		Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02	Mar-03		Jun-03	Sep-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02	Mar-03			Jun-03	Sep-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04
	Pump Elevation (ft amsl)	nd	nd	nd	4263.2	4256.7	4260.7	4248.7	4254.7	4249.7	4249.7	4249.7^	4251.7*	4251.7^	4247.7*	4247.7^	4248.7	4248.7^	4248.3	4248.3^	nd	nd	nd	4262.5	4253.0	4241.0	4252.0	4247.5	4248.0	4247.0	4247.0	4246.0	4246.0	nd	nd	nd	4261.2	4261.2	4255.2	4260.2	na	na	na	na	na	na	na
1,1,1-TCA		10 U	10 U	10 U	0.49 J	0.55	0.50 U	0.61	0.40 J	0.36 J	0.45 J	0.53	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.29 J	0.28 J	0.32 J	0.28 J	0.50 U	0.40 J	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
1,1-DCA		10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.15 J	0.21 J	0.22 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
PCE		nd	nd	nd	0.50 U	0.50 U	0.5 U	0.5 U	0.17 J	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
TCE		0.91 J	10 U	10 U	1.0	1.3	0.50 U	1.1	0.54	2.0	4.1	4.9	6	8	8	10	12	12	8	10	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
cis-1,2-DCE		0.6 J	10 U	10 U	0.26 J	0.31 J	0.50 U	0.39 J	0.50 U	0.78	4.2	4.5	8	10	15	16	16	17	10	11	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
Acetophenone		10 U	10 U	nd	0.50 U	0.50 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U	5.1 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.26 J	10 U		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5 U	5 U	5 U	5 U	nd	nd	nd	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.1 U	5 U	5 U	5 U	5 U
Benzene		nd	nd	nd	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.18 J	0.50 UR	5 U	5 U	5 U	5 U
Methylene Chloride		10 U	10 U	10 U	0.50 U	0.50 U	1.4 UJB	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1 J	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
MTBE		nd	nd	nd	0.50 U	0.50 U	0.5 U	0.5 U	0.5 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 UJ	5 UJ	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.18 J	0.50 U	0.17 J	0.50 UR	5 U	5 UJ	5 U	5 U
Bromoform		10 U	2 J*	10 U	0.18 J	0.50 U	0.20 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 U	5 U	5 U
Chloroform		10 U	10 U	10 U	0.20 J	0.17 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 UJ	5 UJ	5 U	5 U	5 U	5 U	10 U	10 U	10 U	0.19 J	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	5 U	5 U	5 U	5 U	nd	nd	nd	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	5 U	5 UJ	5 U	5 U
TPH-GRO		1.1 U	1.1 U	1.1 U	47 U	50 UJ	250 U	250 U	50 U	50 U	50 UJ	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1.1 U	1.1 U	1.1 U	25 UJ	250 U	250 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	nd	nd	nd	26 U	250 U	250 U	50 U	50 U	50 UJ	50 U	50 U	50 U	50 U
bis(2-Ethylhexyl)phthalate		nd	nd	nd	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UB	5.0 UB	11 U	11 U	10 U	10 U	10 U	10 U	10 U	10 U	nd	nd	nd	5 U	2.0 J	1.0 J	5.0 U	5.0 UJ	5.0 UB	11 U	10 UJ	10 U	10 U	nd	nd	nd	5 U	2.6 J	1.9 J	5.0 U	5.0 U	5.0 UB	11 U	10 UJ	10 U	10 U

Analyte (ug/L)	Well ID	MW-07														MW-08												MW-09												MW-10								
	Sampling Event	May-02[1]	Jan-03[1]	Jun-03[1]	Dec-01[1]	Mar-02[1]	Jul-02[1]	Dec-02	Mar-03	Jun-03	Sep-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	Jan-04		Feb-04		Mar-04		Apr-04		Jan-04			Feb-04			Mar-04			Apr-04			Feb-04		Mar-04			Apr-04		
	Pump Elevation (ft amsl)	nd	nd	nd	nd	nd	nd	nm	na	na	na	na	na	na	na	na	4238.8	4230.8^	4233.8	4233.8^	4233.8	4233.8^	4232.8	4232.8^	4244.8	4178.8*	4141.8	4244.8*	4178.8	4141.8	4244.8*	4178.8	4141.8	4244.8*	4178.8	4141.8	4248.7*	4180.8	4140.7	4248.7	4180.8	4140.7	4248.7	4180.8	4140.4
1,1,1-TCA		nd	nd	nd	nd	nd	nd	nm	0.65	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DCA		82	430	nd	nd	nd	nd	nm	3.6 JD	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
PCE		nd	nd	nd	nd	nd	nd	nm	0.5 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TCE		861	750	672	nd	nd	nd	nm	180 D	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J	5 U	5 U	2 J	5 U	5 U	2 J	5 U	5 U	1 J	5 U	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U
cis-1,2-DCE		nd	nd	600	nd	nd	nd	nm	180 D	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8	5 U	5 U	4 J	5 U	5 U	4 J	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U	8	5 U	5 U	10	5 U	5 U
Acetophenone		nd	nd	nd	nd	nd	nd	nm	5.0 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene		nd	nd	nd	nd	nd	nd	nm	0.5 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride		nd	nd	nd	nd	nd	nd	nm	8.6 JDB	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
MTBE		nd	nd	nd	nd	nd	nd	nm	0.5 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform		nd	nd	nd	nd	nd	nd	nm	10 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	2 J	2 J	5 U	5 U	5 U	2 J	5 U	5 U	5 U	2 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform		nd	nd	nd	nd	nd	nd	nm	10 U	nm	nm	nm	nm	nm	nm	nm	5 U	5 U	5 U	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U
TPH-GRO		nd	nd	nd	nd	nd	nd	nm	250 U	nm	nm	nm	nm	nm	nm	nm	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
bis(2-Ethylhexyl)phthalate		nd	nd	nd	nd	nd	nd	nm	1.0 J	nm	nm	nm	nm	nm	nm	nm	11 U	1 J	10 UJ	10 U	10 U	10 U	10 U	10 U	4 J	4 J	10 U	3 J	10 UJ	10 UJ	10 U	1 J	10 U	10 U	10 U	10 U	4 J	10 U	11 J	2 J	10 U	10 U	1 J	10 U	10 U

Notes:
VOC - Volatile Organic Carbon
SVOC - Semi-volatile Organic Carbon
TPH - Total Petroleum Hydrocarbons
IWOR - Intermountain Waste Oil Refinery
OU - Operable Unit
ug/L - Micrograms per liter
ft amsl - Feet above mean sea level
TCA - Trichloroethane
DCA - Dichloroethane
PCE - Tetrachloroethene
TCE - Trichloroethene
DCE - Dichloroethene
GRO - Gasoline Range Organics
COC - Contaminant of Concern
MTBE - Methyl tert-Butyl Ether
J - Reported concentration detected, but estimated because lacking confidence in value
U - Not Detected
D - Dilution
nd - No data available
nm - Not measured
na - Not applicable

* Multiple samples collected, the higher of the two results is reported
^ Results from high-flow sampling methods.
6.30 - Concentrations of site COCs in *Bold-Italics* exceed RBCs
6.30 - Concentrations of site COCs in ***Bold-Italics-Underlined*** exceed RBCs and MCLs

1 - Historical analytic results sources: *Trip Memorandum for the Installation of Monitoring Wells and First Quarter Groundwater Sampling March 2002, Washington Group International;* *Trip Memorandum for the Second Quarter Groundwater Sampling, July 2002, Washington Group International; Trip Memorandum for the Third Quarter Groundwater Sampling, July, 2002, Washington Group International;* data not found in these reports were supplemented by electronic data files submitted to CDM.

Table 6-2: Summary of Detected VOC, SVOC, and TPH Subsurface Soil Sample Results, IWOR OU2

Analyte (µg/Kg)	Sample Location	BH01		BH02		BH03	BH04		PZ01	PZ02	PZ03	MW-04		MW-05	DP01		DP02	DP03			DP04	DP05			DP06		DP07			DP08		DP09	DP10		PP01-0001	PP02-0002	PP03-0003	TE01-0007	TE02-0007	TE03-0002	SS01	SS02	SS03
	Sample depth (feet bgs)	11-12	36-37	6-7	42.5-43.5[1]	6-7	11-12	36-37	107-108	102-103	108-109	48-49	103-104	101-102	10-15	48-49	10-15	0-1	10-15	10-15	0-5	1-5	10-15	10-15	20-25	10-15	15-25	40-45	10-15	20-25	10-15	10-15	15-27	na	na	na	na	na	na	na	na	na
1,1,1-TCA		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	29	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	20 U	10 U	1,400 U	1,400 U	100 U	100 U	45 U
1,1-DCA		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	4 J	12 U	10 U	nm	15 U	7 J	10 U	1,500 U	10 U	22 J	13	10 U	7 J	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	100 U	100 U	11
PCE		29	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	10 U	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	100 U	100 U	45 U
TCE		12 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	10 U	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	10 U	7 J	1,400 U	1,400 U	100 U	100 U	45 U
cis-1,2-DCE		16 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	7 J	10 J	11 U	10 U	7 J	12 U	10 U	nm	15 U	11 U	10 U	460 J	5 J	190 J	84	20	12	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	100 U	100 U	18
Acetophenone		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	460 U	360 U	360 U	330 U	430 U	410 U	340 U	nm	510 U	390 U	nm	390 U	340 U	130 J	410 U	330 U	380 U	450 U	330 U	nm	nm	330 W	350 U	350 U	350 U	nd	nd	nd
Benzene		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	750 J	10 U	18 J	5 J	5 J	11 U	13 U	10 U	10 W	10 W	10 U	4 J	1,400 U	1,400 U	66	84	2.2 U
Ethylbenzene		14 J	nd	800	130	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	24	nm	15 U	11 U	10 U	6,300	76	690 D	2,100 J	81	11 U	13 U	10 U	10 W	10 W	10 U	18	840 J	2,700	1,800	1,300	18
Toluene		11 J	nd	600	76	nd	16 J	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	3 J	nm	15 U	11 U	10 U	1,500 U	5 J	6 J	16	110	11 U	13 U	10 U	40 J	40 J	6 J	5 J	360 J	810 J	200	900	8.8
Xylene (total)		58 J	nd	3,870 J	1,520 J	2 J	49 J	nd	3 J	nd	nd	nd	nd	nd	14 U	11 U	11 U	28	13 U	12 U	96	nm	15 U	11 U	10 U	44,000	410	3,900 D	13,000 J	330	11 U	13 U	10 U	280 J	260 J	30	1,200 D	6,800	30,000	13,000	13,000	250
Methylene Chloride		nd	8 J	nd	32 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	6 J	nm	15 U	11 U	10 U	1,500 U	10 U	10 U	4 J	5 J	11 U	13 U	10 U	7 J	7 J	10 W	10 W	1,400 U	1,400 U	250 U	250 U	11 U
MTBE		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	10 U	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	nd	nd	nd
Bromoform		nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	10 U	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	100 U	100 U	45 U
Chloroform		nd	1 J	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	14 U	11 U	11 U	10 U	13 U	12 U	10 U	nm	15 U	11 U	10 U	1,500 U	10 U	4 J	1,500 U	10 U	11 U	13 U	10 U	10 W	10 W	10 U	10 U	1,400 U	1,400 U	100 U	100 U	45 U
TPH-GRO (mg/kg)		39,000 J	nd	140,000 J**	280,000**	nd	nd	nd	nd	nd	nd	nd	nd	nd	54 W	nm	53 U	nm	53 U	53 U	nm	3,700 J	54 U	53 U	nm	50,000 J	16,000 J	49,000 J	nm	nm	nm	nm	nm	20,000 J	53,000 J	13,000	11,000	38,000 J	22,000	nd	nd	nd
bis(2-Ethylhexyl)phthalate		nd	nd	nd	89 J	nd	nd	nd	39 J	nd	66 J	nd	nd	nd	460 U	360 U	360 U	1,000 J	430 U	1,400	2,300 J	nm	670	160 J	nm	12,000 JD	760 J	3,800 JD	1100	1,700 J	1400 U	330 UR	nm	nm	370 UR	350 U	350 U	350 U	nd	nd	nd
TOC (mg/kg)		6,000 J	400 J	8,600	3,300	nd	1,200	400	200	100	200	300	300	200	3,700 J	2,600 J	nm	nm	2,700 J	3,600 J	nm	9,500 J	3,900 J	2,300 J	nm	26,000 J	2,600 J	6,700 J	nm	nm	nm	nm	nm	28,000 J	> 83,000 J	12,000 J	15,000 J	15,000 J	49,000 J	1,400	1,600	4,700
pH		nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	8.0 J	8.3 J	nm	nm	8.0 J	8.0 J	nm	8.1 J	8.2 J	8.0 J	nm	7.9 J	8.5 J	7.9 J	nm	nm	nm	nm	nm	8.2 J	8.2 J	8.2 J	8.1 J	8.1 J	8.2 J	nd	nd	nd

Analyte (µg/Kg)	Sample Location	MW-06												MW-08																					
	Sample depth (feet bgs)	9-10	19-20	29-30	39-40	49-50	59-60	69-70	79-80	89-90	99-100	119-120	139-140	9-10	14-15	19-20	29-30	39-40	49-50	59-60	69-70	79-80	89-90	99-100	115-116	139-140	159-160	182-183	199-200	219-220*	239-240
1,1,1-TCA		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
1,1-DCA		2 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	15	230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
PCE		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
TCE		5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 J	5 U	5 U	5 U	5 U	6 U	230 U	5 U	5 U	6 U	6 U	2 J	5 U	2 J	2 J	6 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
cis-1,2-DCE		2 J	5 U	5 U	5 U	12	5 U	5 U	7	5 U	5 U	5 U	5 U	6 J	230 U	5 U	1 J	14	39	5 U	8	15	6 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]	[illegible]
Acetophenone		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6 U	230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Benzene		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2 J	230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Ethylbenzene		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	9	450	5 U	29	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Toluene		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6	88 J	5 U	4 J	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Xylene (total)		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	69	3,100	5 U	120	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Methylene Chloride		23	5 U	7	2 J	5 U	4 J	5 U	2 J	5 U	5 U	5 U	5 J		230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
MTBE		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Bromoform		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
Chloroform		5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U		230 U	5 U	5 U	6 U	6 U	5 U	5 U	6 U	6 U	5 U	5 U	5 U	5 U	5 U	[illegible]	[illegible]	[illegible]
TPH-GRO		88	54 U	52 U	52 U	54 U	54 U	52 U	58 U	54 U	52 U	54 U	52 U	2,200	140,000 J	53 U	79,000 J	59 U	57 U	53 U	22 U	32 U	38 U	19 U	25 U	27 U	80 U	[illegible]	[illegible]	120 J	[illegible]	[illegible]
bis(2-Ethylhexyl)phthalate		340 U	360 U	340 U	340 U	350 U	350 U	340 U	390 U	360 U	350 U	350 U	39 J	150 J	220 J	42 J	130 J	53 J	86 J	39 J	360 U	380 U	360 U	340 U	360 U	360 U	360 U	[illegible]	[illegible]	[illegible]	[illegible]
TOC (mg/Kg)		1,200	1,110	620	1,300	1,000	810	1,200	1,500	580	810	2,200	790	1,300	8,200	590	2,000	880 J	4,700	290 J	350	48,000	430	340	2,300	380	240	190	260	560	400
pH (SU)		8.4 J	8.5 J	8.8 J	8.3 J	8.3 J	8.8 J	9.1 J	8.5 J	8.9 J	9.0 J	8.6 J	8.2 J	8.0 J	8.0 J	8.0 J	8.2 J	8.2 J	8.1 J	8.1 J	8.3 J	8.0 J	8.2 J	8.5 J	8.3 J	8.0 J	8.3 J	8.3 J	8.1 J	8.1 J	8.2 J

Analyte (µg/Kg)	Sample Location	MW-10 *																
	Sample depth (feet bgs)	9-10	19-20	29-30	39-40	49-50	59-60	69-70	79-80	89-90	99-100	119-120	139-140	159-160	179-180	199-200	219-220	234-235*
1,1,1-TCA		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
1,1-DCA		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
PCE		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
TCE		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
cis-1,2-DCE		3 U	4 U	3 U	4 U	4 U	4 U	3 U	7	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Acetophenone		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Benzene		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Ethylbenzene		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Toluene		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Xylene (total)		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Methylene Chloride		3 U	4 U	2 J	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
MTBE		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Bromoform		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
Chloroform		3 U	4 U	3 U	4 U	4 U	4 U	3 U	4 U	3 U	3 U	3 U	4 U	4 U	4 U	2 U	4 U	3 U
TPH-GRO		72 U	52 U	52 U	53 U	53 U	56 U	52 U	58 U	52 U	52 U	56 U	54 U	53 U	54 U	52 U	56 U	54 U
bis(2-Ethylhexyl)phthalate		350 W	340 W	340 W	350 W	350 W	370 W	340 W	380 W	340 W	340 W	360 W	350 W	340 W	350 W	340 W	370 W	350 W
TOC (mg/Kg)		940	370	390	620	140	490	440	1,300	100 U	100 U	100 U	200	360	100 U	150	100 U	100 U
pH (SU)		8.4 J	8.6 J	8.8 J	8.6 J	8.5 J	8.8 J	8.9 J	8.5 J	9.1 J	9.0 J	8.6 J	8.9 J	8.9 J	9.0 J	8.9 J	8.4 J	8.9 J

** Results from analysis reported in range of C6 to C12 hydrocarbons. GRO is typically considered to be the range of C5 to C10 hydrocarbons.

[1] Results from Washington Group RI report this sample collected from 42.5 to 43.5 feet bgs, however borehole was only completed to a depth of 41.5 feet bgs.

Notes:
VOC - Volatile Organic Carbon
SVOC - Semi-volatile Organic Carbon
TPH - Total Petroleum Hydrocarbons
IWOR - Intermountain Waste Oil Refinery
TCA - Trichloroethane
DCA - Dichloroethene
PCE - Tetrachloroethene
TCE - Trichloroethene
MTBE - Methyl tert-Butyl Ether
nd - No data available
nm - Not measured
na - Not applicable
J - Reported concentration detected, but estimated because lacking confidence in value
U - Not Detected
D - Dilution
* Multiple samples collected, the higher of the two results is reported
OU - Operable Unit
µg/Kg Micrograms per kilogram
ft amsl - Feet above mean sea level
DCE - Dichloroethene
GRO - Gasoline Range Organics
COC - Contaminant of Concern

Table 9-1: Cost Analysis of Alternatives

Description	Alternative GW-1 No Action	Alternative GW-2 Extraction, Treatment, Discharge	Alternative GW-3 SVE, Extraction, Treatment, and Discharge	Alternative GW-4 AS, SVE, Extraction, Treatment, and Discharge	Alternative GW-5 DPE, Treatment, and Discharge
Duration	Indefinite*	5 years	5 years	4 years	4 years
Capital Costs	$0	$149,200	$153,400	$158,500	$156,400
Annual O&M (yr 1)	$0	$176,700	$181,200	$186,500	$181,200
Annual O&M 2nd yr through duration	$0	$313,335	$327,894	$266,778	$254,027
Periodic Cost	$39,087	$18,324	$18,324	$18,324	$18,324
Total Present Worth	$39,100	$646,100	$669,000	$618,000	$598,200

Table 10-1: Comparative Analysis of Alternatives

Alternative Designation	Protection of Human Heath and the Environment	Compliance with ARARs	Short-Term Effectiveness	Long-Term Effectiveness	Reduction in Toxicity, Mobility, or Volume Through Treatment	Implementability	Present Worth Cost (in thousands)
GW-1: No Further Action	Not protective.	No.	Not effective.	Not effective.	None.	Implementable.	$39
GW-2: Groundwater Extraction, Treatment, and Discharge	Protective. Meets RAOs including ICs that would provide restriction on groundwater use during duration of treatment.	Yes.	Effective. The time estimated to restore the aquifer with this alternative is 5 years.	Effective. 5 years to restore aquifer.	Contaminants are permanently removed from the site by the treatment process.	Implementable.	$646
GW-3: SVE/Groundwater Extraction, Treatment, and Discharge	Protective. Meets RAOs including ICs that would provide restriction on groundwater use during duration of treatment.	Yes.	Effective. The time estimated to restore the aquifer with this alternative is 5 years.	Effective. 5-years to restore aquifer.	Contaminants are permanently removed from the site by the treatment process.	Implementable	$669
GW-4: AS, SVE, Extraction, Treatment, and Discharge	Protective. Meets RAOs including ICs that would provide restriction on groundwater use during duration of treatment.	Yes.	Effective. The time estimated to restore the aquifer with this alternative is 4 years.	Effective. 4-years to restore aquifer.	Contaminants are permanently removed from the site by the treatment process.	Implementable.	$618
GW-5: DPE, Treatment, and Discharge	Protective. Meets RAOs including ICs that would provide restriction on groundwater use during duration of treatment.	Yes.	Effective. The time estimated to restore the aquifer with this alternative is 4 years.	Effective. 4 years to restore aquifer.	Contaminants are permanently removed from the site by the treatment process.	Implementable.	$598

TABLE 12-1: Cost Summary for the Selected Remedy (Alternative GW-5 costs)

Alternative GW-5
DPE, Treatment, and Discharge

COST ESTIMATE SUMMARY

Site: Intermountain Waste Oil Refinery
Location: Utah
Phase: Feasibility Study (-30% to +50%)
Base Year: 2004
Date: June 2004

CAPITAL COSTS:

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Contractor Work Plans	CW-1	1	LS	$26,313	$26,313	
Mobilization/Demobilization of Drill Rig	CW-7	0	LS	$1,897	$0	Mobilize/demobilize drill rig and equipment.
Extraction Well Installation	CW-9	0	EA	$38,005	$0	Drill/install extraction well (130 feet bgs)
Extraction Well Pumps	CW-12	2	EA	$2,432	$4,864	Install submersible pumps
DPE Well Installation	CW-9	0	EA	$38,005	$0	
DPE System Blower	CW-12	1	EA	$758	$758	Install blower
Yard Piping	CW-13	1	LS	$5,224	$5,224	Extraction well and effluent discharge piping
Treatment System	CW-16	1	LS	$9,199	$9,199	Treatment system with GAC and influent tank
Treatment System Pumps	CW-12	2	EA	$2,714	$5,428	Transfer pumps
Treatment System Building	CW-17	1	LS	$15,826	$15,826	15-feet by 15-feet pre-engineered building
Disposal of Treated Water	CW-26	1	LS	$9,413	$9,413	
				SUBTOTAL	$77,025	
Contingency (Scope and Bid)		40%			$30,810	25% Scope, 15% Bid (High/mid values of recommended range)
				SUBTOTAL	$107,835	
Project Management		10%			$10,784	Percentage from Exhibit 5-8 was used
Remedial Design		20%			$21,567	Percentage from Exhibit 5-8 was used
Construction Management		15%			$16,175	Percentage from Exhibit 5-8 was used
				TOTAL	$156,361	
				TOTAL CAPITAL COST	$156,400	

ANNUAL COSTS: TREATMENT SYSTEM O&M (YEAR 1)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
O&M of Treatment System	CW-20	1	LS	$72,210	$72,210	Cost is per year.
Treatment System Influent and Effluent Monitoring	CW-6	1	LS	$16,577	$16,577	Treatment system influent and effluent monitoring
Groundwater Monitoring	CW-4	1	LS	$35,214	$35,214	Cost is for annual quarterly groundwater monitoring
				SUBTOTAL	$126,001	
Contingency (Scope and Bid)		15%			$18,900	5% Scope, 10% Bid (Low values of recommended ranges)
				SUBTOTAL	$144,901	
Project Management		10%			$14,490	The high end of the recommended range was used
Technical Support		15%			$21,735	The mid value of the recommended range was used
				TOTAL	$181,126	
				TOTAL ANNUAL TREATMENT SYSTEM O&M COST	$181,200	

Continued on Next Page

TABLE 12-1: Cost Summary for the Selected Remedy (Alternative GW-5 costs)

Alternative GW-5
DPE, Treatment, and Discharge

COST ESTIMATE SUMMARY

Site: Intermountain Waste Oil Refinery
Location: Utah
Phase: Feasibility Study (-30% to +50%)
Base Year: 2004
Date: June 2004

ANNUAL COSTS: TREATMENT SYSTEM O&M (AFTER YEAR 1)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
O&M of Treatment System	CW-18	1	LS	$41,741	$41,741	Cost is per year.
Treatment System Influent and Effluent Monitoring	CW-6	1	LS	$6,786	$6,786	Treatment system influent and effluent monitoring
Groundwater Monitoring	CW-4	1	LS	$23,476	$23,476	Cost is for annual quarterly groundwater monitoring
				SUBTOTAL	$72,003	
Contingency (Scope and Bid)		15%			$10,800	5% Scope, 10% Bid (Low values of recommended ranges)
				SUBTOTAL	$82,803	
Project Management		10%			$8,280	The high end of the recommended range was used
Technical Support		15%			$12,420	The mid value of the recommended range was used
				TOTAL	$103,503	
			TOTAL ANNUAL TREATMENT SYSTEM O&M COST		$103,600	

PERIODIC COSTS: FIVE-YEAR REVIEW AND ICP REVIEW/UPDATE (EVERY 5 YEARS)

DESCRIPTION	WORKSHEET	QTY	UNIT(S)	UNIT COST	TOTAL	NOTES
Five-Year Review Report	CW-2	1	LS	$11,278	$11,278	Cost is per Five-Year Review Report
Institutional Control Plan Review/Update	CW-3	1	LS	$6,577	$6,577	Cost is per Institutional Control Plan Review/Update
				SUBTOTAL	$17,855	
Contingency (Scope and Bid)		15%			$2,678	5% Scope, 10% Bid (Low values of recommended ranges)
				SUBTOTAL	$20,533	
Project Management		10%			$2,053	The high end of the recommended range was used
Technical Support		15%			$3,080	The mid value of the recommended range was used
				TOTAL	$25,666	
			TOTAL PERIODIC FIVE-YEAR AND ICP REVIEW/UPDATE COST		$25,700	

TABLE 12-1: Cost Summary for the Selected Remedy (Alternative GW-5 costs)

Alternative GW-5
DPE, Treatment, and Discharge

COST ESTIMATE SUMMARY

Site: Intermountain Waste Oil Refinery
Location: Utah
Phase: Feasibility Study (-30% to +50%)
Base Year: 2004
Date: June 2004

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR(S)	TOTAL COST PER YEAR	DISCOUNT FACTOR (7%)	PRESENT VALUE	NOTES
Capital Cost	0	$156,400	1.0000	$156,400	Capital (one-time) cost
Annual Treatment System O&M Cost Year 1	1	$181,200	0.9350	$169,422	Annual cost, year 1
Annual Treatment System and Monitoring Cost After Year 1	2 to 4	$103,600	2.4520	$254,027	
Five-Year Review Report/IC Plan Review/Update Cost	5	$25,700	0.7130	$18,324	Periodic cost, every 5 years beginning in year 5
				$598,173	
TOTAL PRESENT VALUE OF ALTERNATIVE GW-5				$598,200	

Notes:
- Percentages used for indirect costs are based on guidance from Section 5.0 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", EPA 2000.
Total costs presented on this table are rounded to the nearest $100.
- Discount factor is the sum of the present values of the years in which the cost will be incurred. Values were truncated to three significant figures and summed.

Abbreviations:
EA each
QTY quantity
LS lump sum

Table 13-1: Chemical-Specific ARARs for Groundwater

Chemical	MCL/MCLG (mg/L) (1)	State Primary Drinking Water Standard (mg/L)	State Drinking Water Action Levels (mg/L)	State Groundwater Quality Standards (mg/l) (2)
Trichloroethene	0.005/ zero	0.005	NA	0.005

NA No concentration available.

(1) 40 CFR Part 141, Subparts B, F, and G. Maximum contaminant levels (MCLs) are enforceable drinking water standards under the Safe Drinking Water Act. Maximum contaminant level goals (MCLGs) are unenforceable goals at which "no known or anticipated adverse effect on the health of persons" will occur. Under NCP, MCLs and non-zero MCLGs are relevant and appropriate standards for surface and groundwater, which is a current or potential source of drinking water. The MCL for arsenic will change to 0.01 mg/L effective in January 2006.

(2) UAC R317-6-2. State Ground Water Quality Standards. These levels are corrective action standards for cleanup of contaminated groundwater.

Table 13-2: Action-Specific ARARs

Standard, Requirement, Criteria or Limitation	Citation	Description	ARARs Determination	Comment
Well Drilling Standards	UAC R655-4	Establishes standards for drilling and abandonment of wells.	Applicable	Requirements are applicable for installing or abandoning wells at IWOR.
General Requirements for Air Conservation	UAC R307-101	Outlines general requirements for Air Conservation.	Applicable	Compliance with National Ambient Air Quality Standards (NAAQS) required for treatment process that emit contaminant into air. Definitions for Air Conservation rules provided.
Davis, Salt Lake and Utah Counties, Ogden City and any non-attainment area for PM10: Fugitive Emissions and Fugitive dust.	UAC R307-309	Specifies requirements for fugitive dust control in Davis County.	Applicable	This requirement is applicable to activities that could result in the emission of fugitive dust (e.g., construction, excavation).
Conditions for Issuing Approval Orders	UAC R307-401-6	Requirements for implementation of Best Available Control Technology (BACT) and compliance with National Primary and Secondary Ambient Air Quality Standards.	Applicable	These requirements are applicable to air emissions, including emissions from any treatment systems.
Emission Impact Analysis	UAC R307-410	An evaluation of ambient air impacts related to toxic air pollutants is required. The rule defines procedures for developing toxic screening levels for air pollutants.	Applicable	These requirements are applicable for potential air emissions, including those from waste treatment processes.
Small Source Exemptions -- De Minimis Emissions	UAC R307-413-2	Emissions are exempt from regulation under R307-401-6 if they meet the de minimis standards.	Applicable	Actual emissions of VOCs must be less than 5 tons per year. Emissions of any single hazardous air pollutant cannot exceed 500 pounds per year. Emissions of any combination of hazardous air pollutants cannot exceed 2000 pounds per year.
Corrective Action Cleanup Standards Policy - CERCLA and Underground Storage Tank (UST) sites	UAC R311-211	The rule addresses cleanup requirements at CERCLA and UST sites.	Applicable	The clean-up strategy must achieve compliance with the policy. The policy is an applicable requirement that sets forth criteria for establishing clean-up standards and requires source control or removal, and prevention of further degradation.

Table 13-2: Action-Specific ARARs

Standard, Requirement, Criteria or Limitation	Citation	Description	ARARs Determination	Comment
Definitions and General Requirements for Solid and Hazardous Waste	UAC R315-1 and R315-2	Outlines general requirements and provides definitions for Utah Solid and Hazardous Waste rules.	Applicable	General rules and definitions will be applicable to management of generated hazardous wastes.
Hazardous Waste Generator Requirements	UAC R315-5	Outlines requirements for hazardous waste generators. State analog to 40 CFR Part 262.	Applicable	Requirements would be applicable for hazardous waste generated as a result of cleanup activities (e.g., soil excavated during drilling or trenching activities and spent carbon from groundwater treatment units if these wastes exhibit a characteristic of hazardous waste).
Emergency Controls	UAC R315-9	Outlines requirements for emergency controls of hazardous waste spills.	Applicable	The rule specifies requirements for immediate action, cleanup and reporting for hazardous waste spills. The requirements would be applicable for any on-site hazardous waste spills during cleanup activities.
Clean-up Action and Risk-Based Closure Standard	UAC R315-101	This rule establishes risk-based closure standards for management of sites contaminated with hazardous waste or hazardous constituents.	Applicable	The rule allows closure of facilities to risk based standards. It requires appropriate site management for facilities based on identified levels of risk. Appropriate site management may include corrective action, monitoring, post closure care, institutional controls and site security.
Definitions and General Requirements	UAC R317-1	Provides definitions and general requirements for water quality in the state.	Applicable	The provisions of the rule are ARARs for activities involving surface or groundwater.
Ground Water Quality Protection Rule	UAC R317-6	Criteria for groundwater corrective action (R317-6-6.15), including design criteria (R317-6-6.15.E.4.b)	Applicable	Groundwater corrective action requirements apply to contaminated groundwater. Remedies should be designed so that wastes left in place will not result in discharges to groundwater in excess of groundwater quality standards or ACACLs following corrective action.

Table 13-2: Action-Specific ARARs

Standard, Requirement, Criteria or Limitation	Citation	Description	ARARs Determination	Comment
Utah Pollutant Discharge Elimination System Requirements	UAC R317-8	Establishes general requirements, definitions, and criteria/standards for technology-based treatment for point sources and provides pre-treatment requirements for discharge to a publicly owned treatment works (POTW). It also establishes requirements for storm water runoff.	Applicable	The UPDES requirements would be applicable to any point source discharges to a surface water body. Waters discharged into the storm sewer will meet the water quality standards contained in the Bountiful City phase II storm water quality permit. Any water discharged to the sewer system will meet pretreatment requirements of the South Davis Sewer District.
Underground Injection Control (UIC) Program	UAC R317-7	Establishes UIC requirements.	Applicable	The provisions of this rule would apply to any alternative that employed underground injection (e.g., reinjection of extracted groundwater to the aquifer following treatment.)
Water Quality Standards	UAC R317-2	Establishes standards for the quality of surface waters of the State. R317-2-6 defines use designations. R317-2-7 (Water Quality Standards) requires compliance with surface water numeric criteria. R317-2-13 classifies waters of the State. R317-2-14 provides numeric standards for water classes.	Applicable	Waters discharged into the storm sewer will meet the water quality standards contained in the Bountiful City phase II storm water quality permit.

Part 3
Appendix A
Responsiveness Summary

Record of Decision
Intermountain Waste Oil Refinery Operable Unit 2

Part 3
Appendix A
Responsiveness Summary

Comment/Question Subject 1:
Is the contaminant in the ground water the same as in the vapor? Is the on-site vapor addressed by the already in place deed restrictions that require ventilation systems?

EPA Response:
The investigation results indicate that most of the vapors are a result of TPH contamination and therefore, the vapor contamination is not the same as TCE contamination found in groundwater. At the beginning of the operable unit 1 (OU1) investigation, a soil vapor survey was done. The survey covered the Site as well as the surrounding residential and commercial areas. There was no evidence that the soil vapor contaminants or any vapors from contaminated groundwater extended beyond the site.

The OU1 record of decision (ROD) requires a Land Use Control to manage exposure to soil contamination. The OU1 ROD was signed in November 2002. The specifications of this requirement were formalized in an Environmental Notice and Institutional Control and filed with the Davis County Clerk and Recorder's Office. Under this remedy, any future buildings constructed on the Site are required to have a sub-foundation ventilation system that is commonly used to eliminate exposure to radon gas. The Land Use Control addresses the on-site vapors.

Comment/Question Subject 2:
The contamination to the ground water is less than a maximum of 130 feet deep. All the drinking water wells that are used by the municipality are roughly ten times deeper and separated by thick confining layers. So the potential of contamination of drinking water is quite low. Just based on sheer quantity of water there in that lower aquifer, it seems like that that's not much chance for people using that for drinking water. It seems to me like the risk is not there. It seems to me like there's no risk of anyone receiving any contamination from this site and to go back and check every five years and make sure that's still the case and spend $40,000 seems to make a lot more sense than send two-thirds of a million dollars just to have this nonexistent risk go away.

EPA Response:
It is correct that no one is currently drinking the ground water in the zone where the contamination exists. It is hard to predict when or if it may be used as a drinking water source in the future. However, it is considered by the State of Utah a potential drinking water source.

Although the levels of trichloroethylene (TCE) are relatively low, the level is three times the drinking water standard at the property boundary. Levels have increased over the period of the investigation. Although the sources have been removed, it would be technically difficult to determine how much more the levels may continue to increase. The EPA guidance, "Use of

Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," (April 1999) indicates the data must show a decreasing trend in order to rely on natural attenuation and monitoring as a cleanup option. The Site conditions also do not meet the criteria for a technical impracticability waiver per the "Guidance for Evaluating Technical Impracticability of Ground-Water Restoration," (September 1993). EPA believes with a little bit of effort and relatively short time frame (5 years or less) the problem will be addressed so that any use of the ground water will be possible.

Comment/Question Subject 3:
When you pump and treat the water, what is the level that you treat to? How long will the remedy take?

EPA Response:
The groundwater cleanup goals are the maximum contaminant levels (MCLs), commonly referenced as the drinking water standards. The MCL for trichloroethylene (TCE) is 5 µg/l (micrograms per liter). It is expected that the cleanup goal will be reached within five years.

Comment/Question Subject 4:
So what would be the status of the property during the remediation? Can it be developed?

EPA Response:
The property remains a Superfund Site listed on the National Priorities List (NPL). It can be developed now or during the remedy period.

Comment/Question Subject 5:
What's the Site's economic impact on surrounding properties in its current state, and during remediation, and then after you're done? Is that a criterion you evaluate when you look at the approach you take to restore it?

EPA Response:
The economic impact of a land parcel is determined by many factors. The monetary value of a property and those surrounding it is likely impacted by a parcel's contamination status; however, the magnitude of this is not within the role of EPA to determine. Since the property is readily developable in its current state, it can be put into a productive use immediately. Certainly when the ground water is cleaned up to drinking water standards, it should be seen as a improvement over the current state.

Economic impact on a property is not a criterion EPA directly considers when evaluating clean up alternatives. EPA does consider the cost of cleanup alternatives and community concerns when evaluating the cleanup alternatives.